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Development and evaluation of a professional development framework for pharmacy undergraduate students to support their learning in professional practice

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Development and evaluation of a professional development framework for pharmacy undergraduate students to support their learning in professional practice

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Abstract

The roles of pharmacists have changed in the last decades requiring pharmacists to keep up with, and even anticipate, the changes in practice to continue to be competent healthcare professionals. Competency or professional development frameworks have been developed and validated to support pharmacists with their learning and development. However, such a tool has not been developed for pharmacy undergraduate students and it is sensible to think that such a framework might also help pharmacy students in their learning and competency development. Thus, the aim of this research was to identify competencies required of pharmacy undergraduate students and to develop, and evaluate the use of, a professional development framework for these students.

A mixed methods approach was adopted in the two-phased study. A cross-sectional design was employed in the first phase. Literature on pharmacy students' competencies was reviewed and a series of workshops, focus groups and interviews with pharmacy students and academics, and stakeholders in pharmacy were conducted to identify the competencies required of pharmacy students during their degree and to develop the framework. The findings of previous rounds of data collection fed into the subsequent rounds. After five iterations 17 competencies were identified and divided in two clusters: Professional; and Delivery of Patient Care Competencies.

A longitudinal design was used in the second phase. The use of the framework was evaluated with third and fourth year pharmacy students who self-assessed their competencies three times in two schools of pharmacy over the academic year of 2009-2010. The students' self-assessed competencies increased over the year and correlated positively with their examination results and perceived self-directedness towards learning.

This research provides evidence that the framework captures pharmacy undergraduate students' development of their competencies during the academic year based on their self-assessed competence. Thus, the framework can be used as a self-assessment tool to support their learning.

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Abbreviations

ACLF	Advanced Level Competency Framework
BIs	Behavioural indicators
DoH	Department of Health
FG1	Focus group with pharmacy students at University A
FG2	Focus group with academics at University A
FG3	Focus group with pharmacy academics at University C
FG4	Focus group with academics at University B
FG5	Focus group with experts in education
GPhC	General Pharmaceutical Council
GLF	General Level Framework
HCPs	Healthcare professionals
I	Interview
MPC	Modernising Pharmacy Careers
MPharm	Master of Pharmacy
MPharm3/4	Third/Fourth year Master of Pharmacy students
OSCEs	Objective structured clinical examinations
PDF	Professional development framework
PDF(v1)/(v2)/(v3)/(v4)	Professional development framework version one/ two/ three/ four
RPSGB	Royal Pharmaceutical Society of Great Britain
SA1/2/3	First/second/third self-assessment
SDL1/2/3	Self-directedness towards learning at first/second/third self-assessment
UK	United Kingdom
UKCPA	United Kingdom Clinical Pharmacy Association
US	United States
WK1	Workshop with pharmacy academics at International Social Pharmacy Workshop
WK2	Workshop with pharmacy students at International Pharmaceutical Students' Federation Annual Conference
WK3	Workshop with pharmacy students at British Pharmaceutical Students' Association Annual Conference
QAA	Quality Assurance Agency

1 INTRODUCTION

This chapter considers some of the key issues underpinning this thesis. These include the evolving role of the pharmacist, the undergraduate pharmacy programme and the use of competence in the development of professional knowledge, skills and practice. The first section will consider the evolving role of the pharmacist and will include the emergence of the pharmacist's clinical role, policy initiatives affecting the profession and other policy developments. The second section presents an overview of the pharmacy undergraduate programme in the UK, the main changes that have taken place in pharmacy undergraduate education as well as ongoing changes required to address the increasing patient centred role of pharmacists. The last section describes the different approaches to competence and a competency based approach in the pharmacy undergraduate education. An overview of the most common ways of assessing competence in the MPharm degree is given, as well as the use of competency frameworks to support the development of healthcare professionals is described.

1.1 An overview of the evolving role of the pharmacist

In the 1900s pharmacists were a well-known and respected profession amongst other healthcare professions for their ability to compound prescriptions and dispense (Hepler and Strand, 1990; White and Latif, 2006). However, the advances in science and the development of the pharmaceutical industry led to an erosion of the pharmacists' principal role as manufacturer of drug products (Swintosky, 2007; Winfield *et al.*, 2009). On the other hand, the development of the pharmaceutical industry led to increased reliability of drug products and improved formulations (Winfield *et al.*, 2009). This had a positive impact on the patient. However, from the pharmacists' point of view, this was perceived as a threat to the profession, due to the loss of focus on extemporaneous preparations (Swintosky, 2007; Winfield *et al.*, 2009). Nevertheless, with the discovery of new drugs and the rising number of pharmaceutical companies developing an increasing number of pharmaceutical products, the profession of pharmacy was able to develop an expertise in drug product knowledge (Swintosky, 2007). Instead of extemporaneous products, pharmacists began to dispense increasing amounts of prefabricated drug products (Hepler and Strand, 1990). Nonetheless, some extemporaneous dispensing is still

required and has continued to be taught in schools of pharmacy. Thus, pharmacists have retained their expertise in extemporaneous dispensing but have managed to expand their remit more widely to become a 'medicines expert' with expertise across all drug products, both pre-fabricated and extemporaneous.

1.1.1 Advances of clinical pharmacy

The development of the concept of "clinical pharmacy" around the 1960s was one of the most important changes that has affected the development of the profession and even more, the development of pharmacy education (Hepler and Strand, 1990). In the 1960s, clinical pharmacy mainly appeared in hospitals in the US and Canada but afterwards it became known in European countries as well. Francke (2007) described factors that influenced the development of clinical pharmacy. Amongst these were increased roles in drug information, medication errors, drug distribution, monitoring adverse effects of drugs and patient drug profiles. When the concept of "clinical pharmacy" appeared the risks of using medicines was increasingly recognised, which meant that pharmacists did not only have a role in compounding and dispensing but should have a role in ensuring the best medicine available to meet the needs of the patient. While there might be a difference in opinion of what constitutes clinical pharmacy, there seems to be a general agreement that the concept of "clinical pharmacy" refers to activities which are patient-oriented but also includes more interactions with other healthcare professionals (Berman, 2006; Francke, 2007). In the UK pharmacists felt confident adopting the US term of "clinical pharmacists" with the development of the UK Clinical Pharmacy Association (UKCPA) in 1981 (Clinical Pharmacy Association, 2011). But about 20 years after the term "clinical pharmacy" first emerged, there was a lack of clinically focused preparation in undergraduate education, which is still evident today (Hudson *et al.*, 2007). In the UK, the Nuffield report (1986) advocated a series of changes in the pharmacy profession which implied changes to pharmacy education.

Indeed, Swintosky (2007) argued that the "independent practice of medicine" is declining and is going towards an interdisciplinary practice, which involves pharmacists in decision making related to individual patient treatment and in

treatment evaluation. Furthermore, the advance of increasingly demanding roles of pharmacists, support the development of pharmacists in the preparation and administration of drugs and identification of their interaction of drugs when administered to a patient. Additionally, the development of the new roles required pharmacists to suggest appropriate dosage regimens for individual patients and select appropriate drugs for individual patients. By the 1990s, due to their experience in attending medical wards, hospital pharmacists became involved in the healthcare team in a range of different specialties (Hudson *et al.*, 2007). Moreover, becoming part of the healthcare team meant that pharmacists would become a drug information source for patients as well as for other healthcare professionals (Calvert, 1999; Winfield *et al.*, 2009). Pharmacy-led clinical services such as anticoagulation therapy (Garwood *et al.*, 2007), diabetes drug therapy management (McCord, 2006) and lipid-lowering therapy (Traywick *et al.*, 2003) give excellent patient care. However, for pharmacists to be able to provide current and any future roles they have to ensure that they are competent in doing so. Amongst the competencies required of clinical pharmacists Burke et al.(2008) identified patient counselling and provision of drug information which require good communication competencies, both oral and written; decision making, critical thinking competencies. Additionally, clinical pharmacists should be able to work as part of a team, assess patients' medical problems and evaluate patients' drug therapy (Burke *et al.*, 2008).

1.1.2 Inception of pharmaceutical care

Another paradigm shift in the roles of pharmacists took place in the 1990s when Hepler and Strand introduced the term "*pharmaceutical care*" which they defined as "*the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life*" *(Hepler and Strand, 1990)*. The authors argued that pharmaceutical care is a process "through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient". Pharmaceutical care focuses on the quality of medicines use which is relevant not only for pharmacists but also for other healthcare professionals. This

paradigm sees the role of the clinical pharmacist changing from one focused on process to one focused on outcomes (Calvert, 1999).

In the UK, the Royal Pharmaceutical Society of Great Britain (RPSGB)[1], in two of its reports, from two consecutive years emphasised the contribution that pharmacists can make in four major areas: the management of prescribed medicines, the management of chronic conditions, the management of common ailments and the promotion and support of healthy lifestyles (Royal Pharmaceutical Society of Great Britain, 1996, 1997).

A decade later, another significant change has been the introduction of the prescribing role, initially as supplementary (Department of Health, 2005b) and then as independent prescriber (Department of Health, 2006). Whilst supplementary prescribing was seen as a step forward in the roles of pharmacists it was thought to limit the decisions that pharmacists took (Dawoud *et al.*, 2011). Nevertheless, the supplementary prescribing role was believed to improve patient care and pharmacists place in the healthcare team (Dawoud *et al.*, 2011) as well as reducing the workload of doctors (Lloyd *et al.*, 2010). A study which explored pharmacists' views and attitudes towards independent prescribing reported that pharmacists are confident in their competencies required to become independent prescribers (George *et al.*, 2006). However, they felt that training was needed before undertaking this role (George *et al.*, 2006). These reports emphasise once again the move from the traditional supply-based roles into new professional responsibilities. The new roles, such as the prescribing role, whilst aimed to improve patients' access to healthcare, require pharmacists to ensure that they have the appropriate competencies to deliver patient care.

The future pharmacy workforce may fulfil a wide range of roles, which may impact directly or indirectly on patient care. Therefore, pharmacists must possess the appropriate knowledge, attitudes, skills and behaviours which must also match the

[1]In 2010 the regulator role of the Royal Pharmaceutical Society of Great Britain (RPSGB) was taken over by the General Pharmaceutical Council (GPhC) and the professional role was taken over by the Royal Pharmaceutical Society (RPharmS). All references prior to 2010 will refer to the RPSGB and those from 2010 onwards will refer to GPhC.

role(s) they fulfil. These roles may vary depending upon the area of practice. Whilst the majority of pharmacy graduates practice in community pharmacy in England (Medical Education England, 2011), there are also other career paths that a pharmacist may follow. These include for example hospital pharmacy, academia, industry primary care, research, regulatory affairs. Whilst some of these have a direct patient focus, others do not. However, pharmacists may decide to change their career path, thus it is important to equip pharmacy graduates with the underpinning knowledge, skills, attitudes and behaviours that allow them to specialise in their chosen area of pharmacy (World Health Organisation, 2006). Thus, no matter the area of pharmacy where they will be working, pharmacists should demonstrate that they are competent to provide the best possible care to each patient (Swintosky, 2007).

The "Making pharmacy education fit for the future" 2004 report recommended that RPSGB should identify and develop the knowledge, skills and attitudes of the pharmacy workforce (Royal Pharmaceutical Society of Great Britain, 2004b). Furthermore, the report suggested that pharmacy education and training should be mapped onto these. Additionally, the report emphasised that the focus on the needs of patients in the provision of healthcare, will impact on the education and training of pharmacists as well. Indeed, Burke et al.(2008) argued that it is important to identify the competencies required of pharmacists. This has already been done for medical students (Merl *et al.*, 2000) and the GPhC has recently published the competency based educational standards for pharmacy students (General Pharmaceutical Council, 2011a).

Pharmacists' traditional roles of compounding and dispensing have been replaced with a wide range of activities requiring the full range of skills, knowledge and abilities. These activities range from responding to symptoms, monitoring drug treatment (avoiding interactions and detecting adverse drug reactions) and improving adherence to prescribed medication, to promoting health and disease prevention and sharing their expert drug knowledge with the other healthcare professionals to ensure safe, appropriate, effective and economic treatment for patients (Barber *et al.*, 1994). All these changes in the roles of pharmacists and the

recommendations of various reports underline that there needs to be changes in pharmacy education and training.

1.2 Pharmacy education

In a fast changing world higher education plays a very important role in preparing students for the labour market. This means that higher education aims to equip current students with the appropriate knowledge and skills for a particular discipline (Department for Education and Skills, 2003; Bologna Working Group on Qualifications Frameworks, 2005). Students need to have not only the appropriate knowledge and skills, but to develop the appropriate competencies to prepare them for the labour market. In the transition from education to the labour market graduates apply for jobs where they can employ the knowledge acquired at University (Heijke *et al.*, 2003). However, students are expected to develop particular competencies related to their area of study but also generic or transferable competencies. In order to possess a high level of the required competencies at graduation, students should be able to assess their competence, and develop or improve their competencies during their undergraduate course.

It is important to note that not only the roles of pharmacists have changed over time but also the relationship between pharmacists and other healthcare professionals, and between pharmacists and patients (Royal Pharmaceutical Society of Great Britain, 2005). These, as well as the variety of information sources that patients have the opportunity to access nowadays should have an impact on the education and development of current and future pharmacists. Therefore, it is important for the undergraduate education and development of pharmacists that they adapt to, and even anticipate, the changes in practice, so standards of care can be maintained. The RPSGB agreed that changes had to take place to identify the areas of competence (i.e. knowledge, skills, attitudes and behaviour) likely to be required for future pharmacy roles in healthcare (Royal Pharmaceutical Society of Great Britain, 2005). In the same report the RPSGB recommended that competencies for students should be defined. These competencies have now been defined in the new standards for the education and training of pharmacists and it is expected that these would enable pharmacy students to demonstrate a range of

competencies required for current and new roles (Medical Education England. Modernising Pharmacy Careers Programme, 2011). However, the new standards define the competency-based outcomes of the degree. Thus, they do not give indications to students on the support needed (if any) by students to ensure they meet these standards by the end of their degree. By being supported in assessing their competence, students may identify the areas where more work is needed to achieve the level required for a particular competence.

The changes in practice present a challenge for all levels of pharmacy education (RPSGB, 2005). An important change that has already taken place in pharmacy education is the extension of undergraduate training from three to four years in 1997 as it needed to comply with the Bologna Declaration and harmonisation of degrees with European countries (Royal Pharmaceutical Society of Great Britain, 2004b; Sie *et al.*, 2003). Thus, the degree became a master of pharmacy rather than a Bachelor of Science. The extra year prompted universities to redesign their curricula, but based on the same traditional scientific indicative syllabus (Sie *et al.*, 2003). Pharmacy education in the UK today struggles to find the resources for allowing students to have more clinical experience, suggesting that students do not have enough clinical experience. A balance needs to be reached between the subject areas included in the curriculum in order to ensure the competence of the future pharmacy workforce. Another difference between the three year and the four year programme was the incorporation of a research component, usually carried out by students in the final year (Sie *et al.*, 2003).

The wide range of sciences covered during the degree course, were generally described in the indicative syllabus which split the teaching of pharmacy under four major headings including drug action, the drug substance, the medicine product, the patient and healthcare systems and the roles of professionals. However, the indicative syllabus did not require clinical practice (Sosabowski and Gard, 2008) in order to support the increasingly patient-centred care role. In the past four decades, pharmacy was mainly a scientific discipline (Medical Education England. Modernising pharmacy careers programme, 2011). The report argued that currently, in the MPharm degree, students' learning and assessment is *"focused predominantly on the knowledge and skills and not on developing as a member of a*

profession and work-based training". The RPSGB report, Competencies for the future pharmacy workforce (2005), questioned the efficiency of that structure. Hence, the new pharmacy regulator, the GPhC moved towards a competency-based curriculum by developing new competency based standards for the education and training of pharmacists (General Pharmaceutical Council, 2011a). These also encompass a reviewed and updated indicative syllabus in order to emphasise the underpinning knowledge required in order to meet the standards. It now has five major headings: how medicines work, how people work, how systems work, core and transferable skills, and attitudes and values. The new standards focus on what MPharm students are expected to be able to do once they have graduated, that is outcome competencies, rather than inputs of scientific knowledge on its own, which was the way the old indicative syllabus was developed. This demonstrates that the GPhC perceives that a competency-based curriculum is the way forward in pharmacy education. Indeed, in the United States (US) competency-based learning outcomes have been developed for the Doctor of Pharmacy curriculum (Draugalis *et al.*, 2002; Ried *et al.*, 2007) and in Australia pharmacy education is guided by competency standards and an indicative syllabus (Mariott *et al.*, 2008). The evaluation of competency-based learning outcomes based on students' self-assessed attainment and ability to apply those outcomes has been reported in the literature (Purkerson *et al.*, 1996; Scott *et al.*, 2002; Kelley and Demb, 2006;). However, these competency-based learning outcomes have been designed to guide the development of the curriculum of different schools of pharmacy and not for supporting students in developing the competencies expected of them by the end of their degree. Thus, the learning outcomes have been used to inform educators about the outcomes expected of a degree, and are not phrased in a way accessible for undergraduate students. It is assumed that students would know the underpinning knowledge required in order to demonstrate that they attain competence in the different learning outcomes.

There is growing support for the competency based approach (McKavanagh and Smyth, 2011). Such an approach is considered to provide effective formative feedback. On the other hand, there seems to be a general worry that the competency based approach to education will focus students on learning skills and attitudes rather than understanding basic concepts (McKavanagh and Smyth, 2011).

However, the ability to apply skills and attributes is underpinned by the understanding of those basic concepts.

Currently, the MPharm qualification together with a further year of pre-registration training and the registration exam allows students to register with the General Pharmaceutical Council (GPhC). A minimum of 26 weeks of the pre-registration training has to be done in a patient facing environment, such as community or hospital pharmacy, whereas the rest of the pre-registration training can be done in a non-patient facing environment such as pharmaceutical industry or academia (General Pharmaceutical Council, 2011b). In this way students have the opportunity to improve, develop or show their competencies, which prepares them for their future roles as pharmacists. Students do not have to choose their career pathway during the MPharm degree which gives them the opportunity to take a broad based approach to prepare for their chosen profession.

Due to the increasing focus on the clinical roles of pharmacists, the pharmacy degree should change in order to address the needs of the profession, such as more focus on clinical roles and working in a healthcare team (Medical Education England. Modernising Pharmacy Careers Programme, 2011; Royal Pharmaceutical Society of Great Britain, 2004a). The Modernising Pharmacy Careers Programme (MPC) is proposing a five year integrated programme, which would address the future needs of the profession, by integrating work-based practice within the degree (Medical Education England, 2011). Indeed, Waterfield (2010) argued that Schools of Pharmacy should ensure that pharmacy students are able to integrate and apply their knowledge to practice settings.

1.3 Competence, competency and competency frameworks

This section is an overview of the different approaches to competence, competency and competency frameworks as well as the different methods used in the assessment of competence.

The interest in competencies has arisen as it has been widely recognised that knowledge alone cannot account for competence in individuals (Cowling,1999), including here competent healthcare professionals. The acquisition of knowledge alone cannot determine effective performance. Thus, if an individual has the knowledge related to a topic, this does not mean that the individual is competent and can deliver good performance. The individual also has to know how to apply the knowledge into practice, for example, by asking appropriate questions when meeting a patient and using this knowledge to give appropriate and safe advice. Additional training in practical skills, cannot ensure effective performance. The individual should also have appropriate attitudes and behaviour, for example, meeting and advising patients without prejudice.

Competencies are widely used in different professions, from industry and public services to healthcare (Cowling, 1999). However, most of the work related to competencies has been associated with management and the development of competent managers, for example, a study conducted by Boyatzis (1982) involved 2000 managers in the United States. These, as well as other studies, suggest that competencies are something more than just skills; they are a mix of knowledge, skills, attitudes and personal attributes.

A lack of standards in healthcare has led to poor performance, which impacted on patients' health (Department of Health, 2002). Thus, competency based standards have been developed for healthcare professionals at all levels, from undergraduate to postgraduate education. However, some of these are lists of statements which show the required level of performance, but they do not support the individuals in their development and, they do not show individuals how one should attain these standards.

The need to restructure medical, pharmaceutical and other healthcare professions education to ensure students are equipped with the appropriate knowledge, skills and attitudes has been outlined by various bodies (Department of Health, 2007; Medical Education England, 2011). However, there has been an ongoing debate about the appropriateness of a competence-based approach in higher education

(Hyland 1997; Lum, 1999). Chapman (1999) indicated that competencies are important, however, they "must not be allowed to control the curriculum".

In conclusion, it is important to ensure that healthcare professionals are competent. However, in order to do so, it is not enough to identify the required competencies. Healthcare professionals' continuous development should be supported through the development of appropriate self-assessment tools. Competency frameworks are commonly used to support the development of healthcare professionals. However, care should be taken how these are developed and used to ensure they do not become a checklist used haphazardly, but encourage healthcare professionals to think of daily practice, and support them in applying their knowledge to practice and identify any areas where improvement is needed.

1.3.1 Perspectives on competence and competency

According to the Oxford Dictionary, competence or competency is defined as the "*ability to do something successfully or efficiently*". However, there are various theoretical definitions and approaches to competence and competency and additionally, different researchers use these two terms in different ways. Indeed, Norris (1991) has described competence as "an El Dorado of a word with a wealth of meanings". Van Loo and Semeijn (2004) argued that the various definitions related to competence come from different perspectives and described three main perspectives: educational, labour market and human resources. To complicate matters, different terms have been used in the literature to describe similar concepts.

One of the approaches to competence is the behaviourist approach. Hager (1993) and Hyland (1997) argued that the behaviourist or specific tasks approach to competence is reductionist (Hager, 1993; Hyland, 1997) as it cannot describe the breadth of knowledge required for reaching competence (Hyland, 1997). Indeed, behaviours cannot describe all the human behaviours required to demonstrate competence due to their complexity (Grant, 1999; Hyland, 1997) and Hager (1993) argued that the behaviourist approach to competence is about minimum

competence. Eraut (1994) referred to this approach as competency based training which may support an organisation in the design of training. Furthermore, Eraut (1994) described the approach as focusing on the tasks related to a job rather than on individuals' personal traits. Additionally, the number of competencies to be assessed in order to fulfil the objectives of an organisation, can make this approach difficult (Hager, 1993; Eraut, 1994). Norris (1991) described the behaviourist approach to competence from a slightly more generic point of view: the behaviours were demonstrated in particular situations and observed. However, the aim of the behavioural approach can be to support individuals in identifying typical behaviour when a competency is demonstrated (Whiddett and Hollyforde, 2003). However, if the competencies are task-based rather than focused on a holistic competence approach which places the competencies into context, then criticisms that the competencies are reductionist may seem appropriate.

The second approach to competence described in the literature is the generic skills approach. The generic approach to competence described by Eraut (1994) focused on the individual, more specifically, on what enables an employee to perform well in an organisation, including his or her personal traits. Similarly, Norris (1991) described the generic construct of competence as the one which distinguishes between "average and expert performers". In contrast with the behaviourist approach, the generic approach described by both Norris (1991) and Eraut (1994) focused on the individual and what enables him to perform well. Hager (1993) argued that the generic skills are used as "predictors of future performance" and that this approach "encourages excellence that is remote from professional practice".

Another approach to competence described in the literature is the holistic approach, also referred to as the integrated approach (Hager, 1993) which is "inferred from performance" that is demonstrated over time. Indeed , Hager and Gonczi (1996) argued that "while performance of tasks is directly observable, abilities or capabilities that underlie the performance are necessarily inferred". Delamare Le Deist and Winterton (2005) described a holistic model to competence, which was seen as a tetrahedron, which emphasises the strong relationships between cognitive, social and functional competence which focus on knowledge

and understanding, behaviours and attitudes, and skills respectively. In addition, they argued that the holistic approach to competence proposed by them offered an interface between educational and work-based competencies. Norris (1991) argued that being competent does not necessarily imply that the individual has the appropriate knowledge to perform certain tasks. He goes on to question whether knowledge should be assessed separately or whether it could be inferred from effective performance. On the other hand, Lendburg (2008) perceived that the integration of knowledge in practice is an "essential competence that is confirmed through performance assessment".

1.3.1.1 Definitions of competence and competency

The various approaches to competence presented above have determined the development of different definitions of competence. One of them is the definition by Whiddett and Hollyforde (2003) who defined competencies as "behaviours that individuals demonstrate when undertaking job-relevant tasks effectively within a given organisational context". This definition has been used by others in the development of competency frameworks, competency standards or competency-based outcomes for different healthcare professionals or healthcare related undergraduate education (Merl *et al.*, 2000; McRobbie *et al.*, 2001; Goldsmith *et al.*, 2003; Mills *et al.*, 2005;). Jones and Moore (1993) argued that "the effectiveness of competency resides in the manner in which it codifies and regulates behaviour through constructs of skills". These skills provide criteria against which performance of individuals can be accredited (Jones and Moore, 1993). However, care should be taken in the formulation of behaviours to ensure that they do not become a checklist of tasks, but support individuals in reaching the required standards.

Two themes may arise when defining competencies: the description of work tasks, referred to as competence (plural competences) and the description of behaviour, referred to as competency (plural competencies) (Whiddett and Hollyforde, 2003). According to Messick (1984) competence referred to what an individual knew and could do, described by Norris (1991) as the potential, whereas, performance referred to what an individual actually did, described by Norris (1991) as "actual

situated behaviour". Similarly, Eraut (1994) defined competence as "a person's overall capacity" and competency as an individual's "specific abilities". Hager and Gonczi (1996) argued that competence is "a relationship between abilities or capabilities of people and the satisfactory completion of appropriate tasks". On the other hand, competencies are not focusing on the role but on the qualities and characteristics of a person describing how these tasks are achieved. The RPSGB defined competency as "a skill or function" that "includes the underlying knowledge and ability necessary to its performance" (Royal Pharmaceutical Society of Great Britain, 2004b). Boyatzis (1982) defined a job competency as " an underlying characteristic of a person in that it may be a motive, a trait, a skill, an aspect of one's self-image or social role, or a body of knowledge which he or she uses". However, competencies are not about a list of skills, characteristics or traits, they provide examples of what is to be observed as effective performance (Whiddett and Hollyforde, 2003).

Hyland (1997) and Lum (1999) argued that competence-based education is behaviouristic and is mainly concerned with the assessment of performance and not with learning and development. However, an individual should be able to assess his/her own performance in order to identify the gaps and determine what needs to be learnt more or practised. To support individuals with the assessment of performance, behaviours of what constitutes good performance should be identified. Indeed, behaviours that are demonstrated with effective performance should be identified.

Norris (1991) argued that competence and standards are closely related and goes on to say that standards indicate the desired level of achievement and they usually provide criteria against which to evaluate a training. Thus, the development of standards in the MPharm degree is needed in order to provide criteria against which students' performance may be evaluated. The GPhC has recently published new competency based educational standards (General Pharmaceutical Council, 2011a). However, these do not provide guidance to students on how to achieve these. Thus, students need further support in order to ensure that they meet the requirements. As Lum (1999) argued, competency based standards have two distinctive meanings: to prescribe and describe what is required. The standards

developed by the GPhC prescribe what is required of schools of pharmacy. However, further research is needed in order to describe how these standards can be met by students.

A pharmacist is deemed competent if he or she shows appropriate skills, professional knowledge and appropriate attitudes and behaviours in order to face the challenges of the job. As competence is related to a job, requirements for an individual may change over time as the requirements for the job change. At an undergraduate level, this means developing the appropriate competencies that will help students to face the requirements of university studies and those of the job after they graduate. The components of competence of pharmacy undergraduate students will be explored and defined in this study.

In this research project a competency is a quality or characteristic of a person related to effective performance that encompasses knowledge, skills, attitudes and behaviours. A competency may be broken down to behavioural indicators which describe and measure the typical behaviour observed when a person demonstrates a competency (Whidett and Hollyforde, 2003). Competence is defined in this research as the overarching capabilities of a person to perform.

1.3.2 The need for a competency based approach

Healthcare professionals (HCPs) are expected to be competent as patients entrust their lives to them. However, the Bristol Royal Infirmary inquiry into the management of care of children who received paediatric cardiac surgical service between 1984 and 1995 questioned the competence of HCPs (Department of Health, 2002). The inquiry reported a series of flaws and failures both within the NHS and within the hospital, ranging from lack of standards to monitor the quality of care to poor communication, and poor teamwork which led to poor performance. However, no national standards had been developed in the NHS since 1948 when it was formed (Department of Health, 2000). The Bristol Royal Infirmary Report recommended that national standards be developed so that patients could trust that healthcare providers were competent. Furthermore, the Care Quality Commission was established to monitor the improvements in quality

of services. Indeed, since 1997 several bodies have been established to set and inspect standards, such as the National Institute for Health and Clinical Excellence (NICE) and the National Patient Safety Agency (NPSA) to assess and address any issues related to the performance of HCPs and the quality of services provided. The Department of Health (DoH) (1998) introduced the concept of clinical governance as a means for ensuring the competence of HCPs and the quality of healthcare (Department of Health, 1998).

The ongoing development of HCPs starting from their undergraduate degree and continuing throughout their career, mandatory continuing professional development and revalidation has been advocated to ensure the competence of HCPs (Department of Health, 2002). Maintaining and attaining competence through lifelong learning was also emphasised (Department of Health, 1998, 2002). It was recommended that the NHS would provide its employees with the time, money and the opportunities needed for learning (Department of Health, 2002). For this purpose in 2004 the DoH published the "NHS knowledge and skills framework" which described the knowledge and skills required for each job within the NHS (Department of Health, 2004). It aims to support the development of HCPs through regular appraisals of professional development and competence, and to ensure that HCPs have the opportunities to maintain their competence. The four levels identified in the "NHS knowledge and skills framework" indicate that the levels of competence vary within a career of a HCP (Department of Health, 2004). The regular appraisals would ensure not only the competence of the HCPs but also improvements in the quality of services provided to patients. This framework was part of the three work-areas of the "Agenda for Change"(Department of Health, 2005a). One of the other work-areas motivated HCPs to progress into more highly paid positions by demonstrating their competence.

1.3.2.1 Competency of pharmacists

Following these reports, changes started to take place in pharmacy as well. The report on the "Competencies for the future pharmacy workforce" (2005) emphasised the need for the Royal Pharmaceutical Society of Great Britain (RPSGB) at the time, now the new General Pharmaceutical Council (GPhC) to identify the

competences, defined as the knowledge, skills, attitudes and behaviours, likely to be required of pharmacists in the future (Royal Pharmaceutical Society of Great Britain, 2005). Furthermore, the same report urged RPSGB to identify alternative methods for the assessment of these competences. The report emphasised the gap identified between the competencies attained at the time of registration and the competencies required for early career roles and did not see the post-registration courses as a viable long term solution which addressed the issue. In order to address this issue it was recommended that the MPharm programmes keep up to date with the changes in practice in order to ensure the competency of the future pharmacy workforce. Strengthening the generic competence during the MPham programme was also emphasised (RPSGB, Competencies of the Future Pharmacy Workforce. Phase 2 report. 2005). Indeed, Swintowsky (2007) emphasised that it is important to prepare the future pharmacists with the appropriate knowledge and skills for them to be able to take their role in an interdisciplinary team. This requires that the goals of pharmacy education are revised periodically to ensure future pharmacists are equipped for the future roles. Due to the ongoing discoveries and developments the healthcare system is evolving rapidly and it is important to ensure that pharmacists have the competencies to fulfil current and future roles.

The RPSGB developed the Pharmacy Practice Framework (PPF) (Royal Pharmaceutical Society of Great Britain, 2008a), that outlines the main roles and functions of pharmacists from the first day they register. The framework described the outcomes of pre-registration education in "terms of activities rather than competencies". In the consultation process respondents from different sectors suggested that the framework should be more competency based. This may suggest that a competency approach in defining the new roles of pharmacists may be more complex than the "activities" approach suggested by the RPSGB. An outcome of the consultation was that the respondents considered important developing a framework that describes the roles, skills and attitudes of the newly qualified pharmacists,. Taking into account these two findings, there seems to be a need for developing a competency framework for undergraduate pharmacy students. Another important outcome of the report was that pharmacy is seen as a "single profession", students do not have to specialise in a certain area before graduation, allowing pharmacists to specialise in different areas after the

registration with the GPhC (Royal Pharmaceutical Society of Great Britain, 2008a). Therefore, an undergraduate framework should comprise overarching competencies, not too specific for different sectors of practice in the profession, in order to ensure that future pharmacists are able to develop and build on them.

The following key roles for the pharmacy profession were included in the PPF: firstly to use and integrate pharmacy with healthcare systems, to improve health outcomes and delivery to increase safety and effectiveness; secondly to monitor, modify and implement therapeutic approaches (including dispensing prescribed medicines); thirdly to ensure effective systems are in place to manage risk in all sectors of pharmacy; fourthly to deliver patient centred care and fifthly to maintain and improve professional performance (Royal Pharmaceutical Society of Great Britain, 2008a). However, none have yet been developed for future pharmacists, that is, the pharmacy undergraduate students. Furthermore, it is not only important to identify competencies for the current pharmacy workforce, it is also important to ensure that the future pharmacy workforce will be able to perform them at the required level. Whilst the identification of these competencies gives a benchmark for each individual to compare their competence against, it is also important to identify the support that future pharmacists need in order to achieve the required levels of competence. The same applies for the MPharm level. Competencies for the undergraduate level are not exact statements that should lead MPharm students' education, but they should provide guidance to what they are expected to do once they graduate.

Competence may be difficult to achieve, and this was also emphasised by Swintosky (2007) "learning to practise pharmacy competently is a highly complex process". This may also mean that it is not only important to attain competence, but also to maintain it. By introducing mandatory CPD the GPhC ensures that pharmacists attain and maintain their competence (General Pharmaceutical Council, 2010b). The GPhC requires both pharmacists, under the "Standards of conduct, ethics and performance" (General Pharmaceutical Council, 2010c) and pharmacy students under the "code of conduct for pharmacy students" (General Pharmaceutical Council, 2010a), to "develop their professional knowledge and competence". By doing this the pharmaceutical regulator ensures that its members

are required to take responsibility for ensuring they are competent for the roles they have to fulfil. In order to engage in continuing professional development pharmacists should be able to self-assess their own competence. Indeed, Austin et al. (2005) emphasised that some of the distinctive characteristics of CPD are the self-identified learning needs, motivation and responsibility for one's own learning. Support with CPD is available for pharmacists (Wang, 2009). Some of the tools that have been developed in the UK to support self-assessment and the development of pharmacists, are competency frameworks for the advanced and consultant level (ACLF) and for the general level pharmacists (GLF). Similarly, pharmacy undergraduates are required to reflect, develop their professional knowledge and even to recognise their own limitations. But how are students supported in doing this? How does the GPhC ensure that future pharmacists are prepared to face these requirements? It is sensible to think that support should be given to pharmacy students as well. Indeed, Whittle and Murdoch Eaton (2001) emphasised the need to enhance students' self-evaluation skills. This emphasises the need for developing a tool which could support students in assessing their own competence, identifying their learning needs and then providing support for ways in which they could address these needs to ensure that they meet the requirements. This requires the development and implementation of a competency framework for undergraduates.

1.3.3 Assessment of competence

It is not the aim of this chapter to provide an exhaustive description of the competency-based assessments methods. The rest of the section aims to present the most common methods used to assess competence relevant to the present research. These will be presented in turn.

As mentioned, the National Health Service (NHS) Knowledge and Skills Framework (2004) sets out the knowledge and skills required for the NHS staff in order to deliver quality services and recommends regular appraisal of competence and professional development. Healthcare professionals are encouraged to assess their own skills and knowledge to develop professionally. However, self-appraisal may be difficult to achieve and requires certain skills and insights. Well-performing community pharmacists have been found to assess themselves to be less

competent than those performing poorly (Laaksonen *et al.*, 2007). Pharmacists' ability to self-appraise their knowledge, skills and any arising gaps may be guaranteed by ensuring that pharmacy undergraduate students are able to assess their abilities and performance prior to graduation. This requires the development and implementation of a competency framework for pharmacy students.

Norris (1991) argued that "there is a mismatch between the appealing language of precision that surrounds competency or performance based programmes and the imprecise, approximate and often arbitrary character of testing when applied to human capabilities". A competency-based assessment in the undergraduate degree might require more attention to be given to the roles of pharmacists in practice (Wright *et al.*, 2006). The GPhC new standards for education are competency-based and would require, therefore, appropriate methods of assessment. The teaching and assessment methods should change from being teacher focused to being student focused in order to be in line with the requirements in practice (Lenburg, 2008). In medical and nursing education teaching and assessment methods have changed from traditional methods to competency-based ones (Rutter, 2001). Miller (1990) argued that the use of only one method of assessment is not enough in order to assess the complex competencies required of healthcare professionals. Lowry (1993) emphasises that the type of assessment should be selected based on the objective of the assessment, taking into account the strength and weaknesses of each method.

1.3.3.1 Multiple choice questions

Stern et al.(2003) reported that multiple choice questions (MCQs) are appropriate to assess all knowledge based competencies as well as competencies related to critical thinking and research, professionalism, clinical skills, population health. Lowry (1993) emphasised that MCQs are a reliable and reproducible way of assessing factual knowledge, but not clinical skills. On the other hand, MCQs may also be used to provide possible solutions to scenarios used to describe real situations which might give students the possibility to apply their knowledge to "real-life" situations (Wright *et al.*, 2006). One of the criticisms aimed at MCQs is that they encourage recognition of answers by students rather than encouraging

the application of knowledge (Harden *et al.*, 1975; Wright *et al.*, 2006). Indeed, Lenburg (2008) argued that MCQs might help students to complete their course but they are inefficient in helping students to become competent in areas related to communication or critical thinking. Nevertheless, MCQs are still being widely used in the assessment of pharmacy students.

1.3.3.2 Objective structured clinical examinations

Objective structured clinical examinations (OSCEs) are another method of assessing competence. Introduced by Harden in 1975 as a tool to assess the clinical competence of medical students, OSCEs have been widely used ever since. The examination consists usually of a number of stations which assess a particular competency using pre-determined guidelines. The number of stations, the construction of stations, the time allocated for the completion of each station, the allocation of time for training the standardised patients as well as costs have been reported as factors which affect the usefulness of OSCEs (Gupta *et al.*, 2010). While a major problem in the assessment of OSCEs has been reported to be the setting of standards for passing an OSCE (Sturpe, 2010), no standards have been yet defined as minimally accepted. On the other hand, over the years OSCEs have been shown to be a valid and reliable method of assessing clinical competence (McRobbie and Davies, 1996; Munoz *et al.*, 2005). OSCEs have also been used in the Doctor of Pharmacy programmes in the United States (US) (Sturpe, 2010) as well as in the assessment of clinical competence of pre-registration pharmacists (McRobbie and Davies, 1996; McRobbie *et al.*, 2006) and pharmacy students (Rutter, 2001). However, Gupta et al.(2010) argued that OSCEs are not suitable for assessing other general behaviour related to for example teamwork and recommended the use of other methods of assessment. This might suggest that whilst OSCEs are suitable to assess clinical competencies, a combination of methods should be used in order to assess the broad range of competencies required from HCPs (Lowry, 1993; Al-Wardy, 2010).

1.3.3.3 Portfolios

Portfolios have been reported in the literature to promote reflection on learning, whilst including a wide range of assessments and encouraging students to "integrating and assessing evidence of their own learning" (Epstein and Hundert, 2002). However, care should be taken with portfolios in relation to the quality of the evidence, training assessors and students as well as what constitutes sufficient evidence. Al-Wardy (2010) suggested that portfolios are a valid way of assessing outcomes, but they have a low reliability due to the variability in which portfolios are structured and assessed. Buckley et al.(2009) concluded that the evidence related to the educational effects of portfolios in the undergraduate settings is limited. On the other hand, portfolios might be used as a longitudinal tool for the assessment of competence. Portfolios are currently used in the UK by pre-registration students in order to provide evidence on their competence. Using portfolios allows students to collect evidence and encourages them to reflect on their performance. However, for some students the use of portfolios is a new concept that they come across once they start their pre-registration year and they have a limited amount of time to become accustomed to them and to use them efficiently. There is no formal requirement for this portfolio and there is no external assessment of the quality of the evidence and the portfolio itself (Wright *et al.*, 2006).

Dannefer and Henson (2007) argued that competency-based assessments might only target the assessment of specific competencies and possibly neglect the broader picture. This issue was reported to have been addressed in a medical school by including reflection in the assessment of competence (Dannefer and Henson, 2007). Epstein and Hundert (2002) argued that MCQs and OSCEs assess students' short term mastery of specific skills or knowledge while formative feedback was considered to foster self-reflection. The assessment methods in medical schools have been reported to focus on formative feedback rather than summative grades (Dannefer and Henson, 2007; Bierer *et al.*, 2008).

Whilst medical schools have widely adopted OSCEs in the assessment of competence (Burch *et al.*, 2005), nursing schools have adopted the use of

portfolios, particularly in the UK, which implies the documentation of achievement of competence (Rutter, 2001; Yanhua and Watson, 2011). On the other hand, Whitcomb (2002) argued that those responsible for the design and delivery of medical programmes should take more responsibility in documenting the competence of those completing the programmes and concludes that being competent means having the appropriate knowledge, skills and attitudes and behaviours as mentioned before. However, having the appropriate knowledge, skills, attitudes and behaviours is not enough in order to demonstrate that future HCPs are able to deliver high quality and patient centred-care. It requires the ability to translate the gained knowledge, skills, attitudes and behaviours to practice. The introduction of more practice opportunities during the degree studies (Medical Education England, 2011) should be augmented by the development of competency frameworks. This way, pharmacy students would be supported in identifying any gaps in their knowledge and skills that they need to address in order to meet the competency standards but also in documenting their competence.

1.3.3.4 Observation

The use of observation has been reported in the literature for the assessment of competencies related to professionalism, communication, clinical population health, information management and critical thinking and research (Stern *et al.*, 2003). However, it was considered to be inappropriate and unreliable for the assessment of attitudes such as respect, empathy, altruism and honesty (Royal Pharmaceutical Society of Great Britain, 2006). Whilst observation was considered to provide excellent formative feedback it was considered unfeasible and impractical due to the time required in training observers, the time the observers themselves would need to dedicate to this, as well as due to the lack of specific assessment criteria (Farrell, 2005).

1.3.3.5 Other methods of assessing competence

Lastly, another method of assessing clinical competence was described by Miller (1990) (Figure 1.1). The author argued that the "shows how" level, the

performance, or the "does" level, the action, implies achievement of the "knows" level, the knowledge required, and the "knows how" level, the competence. Whereas assessing the knowledge required to perform tasks effectively, the "knows" level, the knowledge is not sufficient to demonstrate competence. However, because competence involves skills and the application of underpinning knowledge, Miller (1990) indicated that it is important to use performance-based assessments in order to assess the "show how" level of the diagram. Currently, this is widely assessed through the use of OSCEs. The fourth level of the framework, "does" involves the assessment of competence in "real life" situations. It involves the observation of an individuals' competence when performing independently in real life. Additionally, Rethans et al. (2002) suggested that Miller's pyramid is useful and efficient in developing educational programmes, in particular the ones which require initial acquisition of knowledge with progress to development of clinical skills.

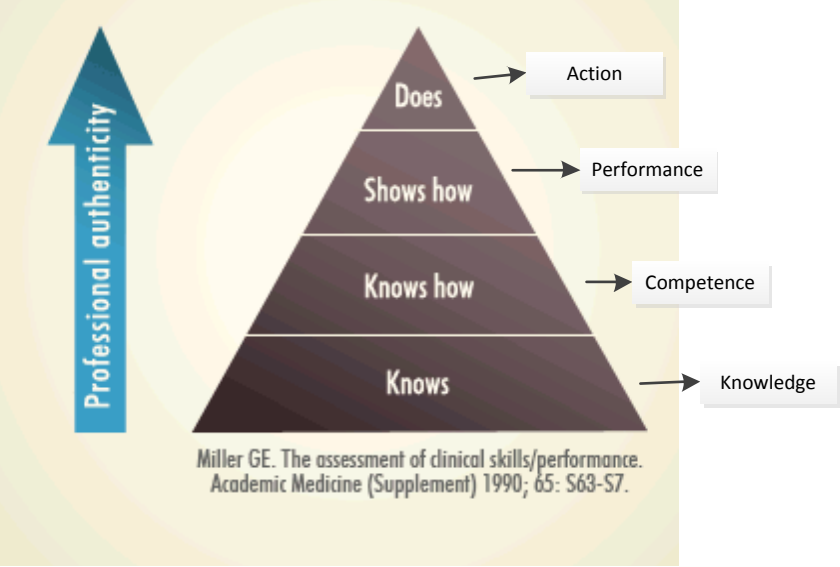

Figure 1.1 Miller's pyramid for assessing clinical competence (adapted from Miller 1990)

While the MCQs focus mainly on assessing the knowledge based competencies, and OSCE on the assessment of clinical competence, a tool to support the assessment of both clinical and general competencies has not yet been developed for pharmacy undergraduate students. Such a tool may provide a broader picture of the complexity of the competencies required of HCPs.

1.3.4 Competency frameworks

The assessment of both clinical and general competencies may be done with the support of competency frameworks. Whiddett and Hollyforde (2003) defined a competency framework as a collection of clusters, competencies and behavioural indicators. This definition was also adopted in the development of competency frameworks for pharmacists (Mills et al 2005). A successful competency framework should be usable, fit for the purpose as well as be based on performance outcomes (Whiddett and Hollyforde, 2003). Furthermore, competency frameworks should be "sufficiently broad-based to allow for universal applicability across all practice settings, but also sufficiently focused to allow the particular competencies, specific to pharmacists to emerge"(Pharmaceutical Society of Ireland, 2011).

People for whom a competency framework is developed should be involved in its development so that the competencies encompassed are relevant to all who will be affected by it (Whiddett and Hollyforde, 2003). Frank and Danoff (2007) argued that competency frameworks are an effective method that can be used for achieving outcomes-based education, an approach which has been recently adopted also by the GPhC. In the UK these have been developed and validated (Mills *et al.*, 2005) for general (Antoniou *et al.*, 2005) and advanced (Meadows *et al.*, 2004) pharmacy practice and are called General Level Framework (GLF) and Advanced Level Competency Framework (ACLF) respectively. The initial development and validation of the GLF focused on pharmacists working in hospitals across one geographical area, London and South East England (McRobbie et al. 2001). Since its inception the GLF has also been adapted for use of community pharmacists in London and the East of England (Mills et al.2008) and is now used widely in postgraduate training. It has been adopted for use of pharmacists in other countries such as Singapore, Croatia (Mestrovic *et al.*, 2011), Serbia and Australia (Coombes *et al.*, 2010). As suggested by Whiddett and Hollyforde (2003), these frameworks have been developed based on literature and by consulting with pharmacists, who have expertise in different sectors of pharmacy (Meadows et al.2004), and by consulting with clinical pharmacists, academics and clinical pharmacy managers (McRobbie et al. 2001). The approach to the development of

the framework was therefore based on consensus development panels. The formulation of the ACLF was achieved through a Delphi technique with input from senior pharmacists based in London. Whilst a small number of practitioners (n=28) were recruited to pilot the use of the ACLF (Meadows et al.2004), it was shown that the ACLF could be used by practitioners to self-evaluate their level of practice. In contrast with the ACLF, the GLF was developed to be used for the evaluation of junior hospital pharmacists or tutees by senior pharmacists or tutors (Antoniou et al., 2005). While self-assessment of competence may be difficult (Laaksonen et al., 2007) it is not known if the tutors received any prior training on how to use the GLF or, if they did, what this training was. However, Antoniou *et al.* (2005) showed that with feedback from mentors the junior hospital pharmacists who used the GLF improved in the majority of the competencies encompassed in the GLF in comparison with those who did not use the GLF. Thus, Antoniou et al. (2005) showed that the use of the GLF supports performance development. Similarly, Mills et al. (2008) observed that pharmacists working in community pharmacies and in primary care trusts improved their performance over 12 months if this process was facilitated by other pharmacists. These facilitators, who visited the pharmacists twice in a 12 month period, received training before the first visit and were debriefed between the two other facilitation sessions. This may have ensured that the facilitation process was consistent. Different approaches have also been taken when deciding the desired level of competence. In the study by Antoniou et al (2005) the tutors decided, based on the GLF, the competency level expected of their tutees, whereas in the study by Mills et al. (2008) pharmacists were asked to identify the desired level of performance for their own role for each of the competencies. However, as the expected competency level was set by the tutors, the junior hospital pharmacists might have been supported in self-assesing their competence. They knew what was expected of them. In summary, the GLF has been demonstrated to support improvement of performance of pharmacists working in different areas of practice (Antoniou et al.2005; Mills et al.2008). In contrast, in this study a consensus approach to developing the PDF was not used, as we wanted to ensure we could reflect the views of a broad spectrum of stakeholders in undergraduate pharmacy education. The approach described in this thesis uses focus groups, workshops and interviews, as well as the input from the research team, to inform and refine the development of a PDF. Grant (1999),

however, argued that a competency framework is not required for assessing competence as OSCEs, simulations and clinical cases may be used for this purpose. While OSCEs simulations and clinical cases may be used for the assessment of specific competencies, they do not offer the broader picture of the complexity of competencies required of HCPs. Additionally, competency frameworks can be used formatively and offer ongoing feedback to their users. These have not only been developed for pharmacists but for other healthcare professionals (Table 1.1). However, the majority of the competency frameworks prescribe what is required of other healthcare professionals, they list standards, rather than prescribing and describing what is required (Lum, 1999).

The ongoing changes in the roles of pharmacists in healthcare, the move towards a patient centred care and the increasing focus on the interdisciplinary healthcare team require changes not only in the way future pharmacists are educated, but also require the development of tools to help them reach the required level. Pharmacists are required to reflect on their own learning needs as part of the mandatory CPD process in order to maintain their registration as pharmacists. They are also required to take responsibility for their own learning and development by self-assessing their competence and reflecting on their performance.

Table 1.1 Examples of frameworks, including competencies and standards, for healthcare professionals

Healthcare profession	Frameworks	Type of document
Pharmacy	A competency framework for pharmacy practitioners General level (McRobbie et al.2001) Advanced level (Meadows et al.2004)	This competency framework may be considered full competencies
	A competency framework for community health pharmacy services (The Primary and Community Care Pharmacy Network, 2009)	This competency framework may be considered standards for community health pharmacy services
	Competencies for pharmacists working in primary care (National Prescribing Centre, 2000)	This may be considered full competencies
Frameworks from other professions		
Health and care	Leadership framework self-assessment tool (NHS Institute for Innovation and Improvement, 2011)	This may be considered a framework, however too general and brief
	Clinical leadership competency framework self-assessment tool (NHS Institute for Innovation and Improvement, 2010)	This may be considered a framework, however, too general
	Medical leadership competency framework self-assessment tool (NHS Institute for Innovation and Improvement,	This may be considered a framework, but it is too general and too brief

	2010)	
Medicine	A framework for the professional development of postgraduate medical supervisors (Academy of medical educators, 2010)	This framework may be considered a list of standards required of postgraduate medical supervisors
	The 2009 framework for undergraduate medical education in the Netherlands (Laan, 2010)	This framework may be considered standards for undergraduate medical education in the Netherlands
	The national education and competence framework for advanced critical care practitioners (Department of Health, 2008)	This framework is a list of standards. However, compared to other lists of standards, in this case the standards are described, and the desired level to be achieved by practitioners pre-identified.
	Competency framework for sub-specialty training in neonatal medicine (Royal College of Paediatrics and Child Health, 2001)	These may be considered competencies
Nursing	Maintaining competency in prescribing. An outline framework to help nurse prescribers (National Prescribing Centre, 2001)	This is a list of standards developed to support nurse prescribers
	Standards for pre-registration nursing education (Nursing and Midwifery Council, 2010)	This may be considered standards for undergraduate nursing education
Dentistry	The first five years (General Dental Council, 2008)	This may be considered is a list of standards for undergraduate dental education
Chiropodists and podiatrists	Standards of proficiency (Health Professions Council, 2009)	This is a list of standards for chiropodists and podiatrists
Optometry	Competency framework for prescribing optometrists (National Prescribing Centre, 2004)	This is a list of standards developed to support prescribing optometrists
Healthcare professionals	A single competency framework for all prescribers	These may be considered full competencies

While competency frameworks have been developed to support HCPs including pharmacists in doing this, self-assessment can be difficult (Laaksonen *et al.*, 2007).This study was conducted with 43 pharmacists in one geographical area, however, it did show that well performing pharmacists self-assessed their competence lower than those performing poorly (Laaksonen et al, 2007), indicating that their lack of ability to self-assess their own competence. Future pharmacists could be supported in developing their self-assessment skills while at the university. However, a competency framework for the undergraduate level has not yet been developed and could prove valuable as a teaching and learning tool to prepare them for professional practice. This will be referred to as professional development framework (PDF) for the purpose of this research.

1.3.5 Summary

The ongoing changes in the roles of pharmacists require them to keep up to date with knowledge and skills in order to perform well, thus improving patient centred care. However, the new roles require pharmacists to develop their own competence in order to be able to fulfil the new roles such as independent prescriber. Since 2009 it is mandatory for pharmacists to engage in CPD. Additionally the new standards developed by the GPhC require pharmacists to develop their professional competence. The various approaches to competence determined the development of various definitions for competence. However, the assessment of competence is not an easy process. As part of the CPD process future pharmacists are expected to be able to assess their learning needs in order to develop their competence. Whilst competency frameworks have been developed for pharmacists in order to support them in assessing their own competence, such a tool has not yet been developed for the future pharmacists, the undergraduate students. The main purpose of a competency framework for the MPharm students would be to support them in their learning.

2 AIMS AND OBJECTIVES

2.1 Aims of the research

The aim of this research was to develop and evaluate a professional development framework (PDF) designed for pharmacy undergraduate students (MPharm students). The study comprised two stages. The first stage aimed to describe and identify competencies expected of MPharm students and to group these competencies in a framework that could be used for pharmacy undergraduate students' professional development and for assessing competence. The second stage of the study aimed to evaluate the use of the PDF as a tool to support the professional development of MPharm students and to make recommendations for future refinement.

The principal research questions are:

i. What are the competencies required of pharmacy undergraduate students?
ii. How can pharmacy undergraduate students be supported in self-assessment of their competence?
iii. How does self-assessed competence relate to objective assessed performance?
iv. How does self-directedness towards learning relate to students' ability to self-assess their competence?
v. How can the PDF be implemented efficiently in the MPharm degree?

2.2 Objectives

To meet the aim the following objectives have been identified:

- To develop and design a PDF by:
    - identifying competencies and behavioural indicators required of MPharm students by reviewing the literature and soliciting the views of relevant stakeholders
    - agreeing which of the identified competencies and behavioural indicators should be encompassed in the PDF;
- To compare MPharm students' self-assessed level of competence with their objectively assessed performance;
- To identify MPharm students' self-directedness towards learning;

- To compare MPharm students' self-directedness towards learning with self-assessed competence;
- To describe MPharm students' perceptions of the PDF;
- To describe relevant stakeholders' views of a PDF for MPharm students; and
- To make recommendations about how the PDF could be used in the future.

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an overview of the research methods used in this study. Overall, the study used a mixed methods approach employing both qualitative and quantitative methods to collect and analyse data. Whilst a qualitative approach was adopted to develop the PDF, a quantitative approach, followed by a qualitative one, were adopted to evaluate the use of the PDF.

Qualitative methods are often employed to gather information, develop research questions and develop data collection tools by focusing on the views of the participants (Smith, 2002). Qualitative or combined methods may be chosen when the researcher aims to explore in depth the views, perceptions, interpretation and experiences of participants. Qualitative methods may be employed in the developmental stages of the research; this was done in the present study in order to identify behavioural indicators and competencies, to explore participants' views about the different versions of the PDF and to explore the participants' views upon competence and competency frameworks. However, a qualitative approach may also be adopted in the later stages of the research. In the present study participants' experiences of using the developed PDF were also explored at the end.

In contrast, quantitative research deals with quantities and the relationship between attributes (Bowling, 2002). The methods of data collection are highly structured. Once the quantitative data have been collected, they are then organised into variables, so that statistical analysis can be employed (Bryman 2008). The contrasts between qualitative and quantitative research are presented in Table 3.1:

Table 3.1 Common contrasts between quantitative and qualitative research (adapted from Bryman 2008

Quantitative	Qualitative
Numbers	Words
Researcher's point of view	Participant's point of view
Researcher distant	Researcher close

Theory testing	Theory emergent
Generalization	Contextual understanding
Hard, reliable data	Rich, deep data

Both qualitative and quantitative methods have their own advantages and disadvantages. However, by using a mixed methods approach the disadvantages of one method are complemented by the other.

Overall, a pragmatic approach to the research was adopted (Creswell, 2007). The pragmatic approach focuses on the nature of the research problem under investigation and what practical steps can be taken to answer that problem. It is a particularly useful approach to adopt in mixed methods studies where both qualitative and quantitative data are collected. This is because of the difficulty in finding a unifying theory for qualitative and quantitative data in this study. Specifically, in this study, the researcher and the research team considered and chose the methods and techniques in order to meet the needs of the research. Thus, different approaches to collecting data, for example, workshops, focus groups and individual interviews, depending on the number of the potential participants and analysing data, for example, competent analysis and quantitative analysis were used. The data collection periods had to fit to the academic year and the activities of both students and staff. Moreover, academic and student conferences were used to reach potential participants, that is, experts. While this is a convenience approach to sampling, it is also a pragmatic, purposive approach. It was not possible to choose the pilot site universities at random due to the high level of collaboration required – the universities were selected pragmatically. What's more, it would have been better if all participating students in the pilot phase had been in their final year. However, such an arrangement was not possible as the OSCEs that were used as an objective measure of performance were not arranged at the university A until 2009 for the third year students. Thus, a pragmatic approach to selecting the student participants in the pilot was taken. In addition to the pragmatic approach, an empiric approach was adopted in the second phase of the research, in order to evaluate the use of the PDF (May, 2001).

As the researcher did not have previous experience of conducting qualitative research and little experience of quantitative research, each step of the research was used as a learning opportunity supported by the research team (Dr Raisa Laaksonen, Professor Marjorie Weiss and Dr Susan Jones). The researcher reflected on both past and future experiences in order to develop and discuss these with the research team, who participated in designing the study, developing the data collection tools and analysing the data. The research team met and discussed after each data collection cycle to triangulate interpretations of ideas. As part of the qualitative analysis, the research team checked the emerging codes and themes as well as provided support to the research in her development. As part of the quantitative analysis the research team reviewed the test employed and planned together with the researcher the next steps of the analysis. As such, a reflexive approach has been used to inform the qualitative component of this work.

3.2 Study design

The present research comprised two phases. In the first part of the research the views of pharmacy students, stakeholders in pharmacy and pharmacy education and academics upon the content of the PDF were explored at one point in time (chapter 4). Therefore, this part of the research was *cross-sectional* (Bowling 2002; Smith 2002). MPharm students' ability to self-assess their competence was explored over a period of one year (chapter 4) , hence making the part of the research related to the evaluation of the use of the PDF a *longitudinal study* Bowling 2002; Smith 2002; Antoniou et al. 2005). Changes in MPharm students' performance were followed up in the future and explored two to three times during the academic year 2009-2010, hence making it a *prospective study*. Longitudinal surveys not only allow the researcher to explore the phenomena but also to provide information on the potential observed associations. One of the well-known disadvantages of longitudinal surveys is attrition. In order to address this issue whole year cohorts were recruited to participate in the evaluation of the use of the PDF. The same cohort of students was followed up at two or three different points in time, thus making it a longitudinal *panel* survey. On the other hand, the researcher may select

a different sample of the population of study every time the phenomena is measured (Bowling 2002). An overview of the study design in provided in Figure 3.1. **Error! Reference source not found.**

3.3 Data collection methods

Common methods of collecting data in both qualitative and quantitative data will be described in this section. Interviews, focus groups and workshops are common ways of collecting qualitative data and were used in the present study to develop the PDF. Focus groups were also used in the second phase of the study to explore MPharm students' views of their experience of using the PDF. Survey methods, a common way of collecting data in quantitative studies, were used in the evaluation of the use of the PDF (chapter 5).

3.3.1 Individual interviews

In qualitative research, participants are allowed to express their own perceptions, feelings and experiences with their own words during interviews (Smith, 2002; Bryman, 2008;). These may be unstructured or semi-structured, depending on their degree of flexibility. An interview guide, comprising the topics or questions that are to be explored during an interview, is developed by the researcher prior to the interview. The interview guide helps the researcher to make the best use of the time during the interview. Other issues than the ones encompassed in the interview guide may be brought up by the interviewees. The researcher may decide to allow the interviewee to talk about them as they might be of interest for the research, or decide to redirect the focus of the interview (Patton, 2002). In semi-structured interviews the interview guide encompasses more specific questions but also allows the interviewee to discuss other issues not encompassed in the interview guide but considered of interest for the research, whilst in unstructured interviews the interview guide serves more as a memory aid and encompasses general themes rather than specific questions (Kumar, 1999; Bryman, 2008). Therefore, the

information provided in semi-structured interviews is more uniform ensuring comparability of the data whilst in unstructured interviews the data provided across interviews may be markedly different. Interviewees are expected to provide spontaneous responses and are encouraged to explain them. While prompting is allowed leading is not.

Interviews may be conducted face to face or over the telephone. Whilst face to face interviews allow the researcher to explore the reactions and behaviour of the interviewees, to clarify questions if needed, to use visual aids and assess nonverbal communication, they might require a lot of travelling. Therefore, they might be time consuming and also require financial support (Kumar, 1999; Neuman, 2006). However, telephone interviews do not allow the researcher to explore the reactions and behaviour of the interviewees but they do not require travelling and more interviews can be conducted in a shorter period of time and the costs can be kept at a lower level.

Due to the above mentioned reasons, geography and lack of funding semi-structured telephone interviews were considered most appropriate in this research. They were used to explore the views of individual experts in pharmacy and pharmacy education on the different versions of the PDF as well as their perceptions of competencies in general (chapter 4.5.2).

3.3.2 Focus groups and workshops

Focus groups explore the perceptions, feelings and experiences of a group of people at the same time (Gibbs, 1997; Patton, 2002). Compared to individual interviews, focus groups enable the researcher to collect a larger amount of information from several participants in a shorter period of time. Similarly to individual interviews, a topic guide comprising the topics or questions that are to be explored during a focus group, is developed by the researcher prior to the focus group. The topic guide helps the researcher to make the best of the time during the focus group. The researcher may allow participants in a focus group to talk about a topic not encompassed in the topic guide, if considered it might be of interest for

the research. Focus group participants interact with each other, therefore, they may stimulate each other and enhance data quality (Gibbs, 1997; Patton, 2002). The interaction allows the participants to re-evaluate their understanding of their own perceptions, views and experiences but also to comment on other participants' views. In contrast with one to one interviews, confidentiality in focus groups cannot be assured; participants' expressed views may be affected by this. Thus, the researcher should carefully select the participants. At the same time the group interaction might encourage some of the participants to share views and experiences which they would not have shared in a one to one interview, or they may feel inhibited by other members of the group. Thus, the researcher should aim to have balanced groups, in terms of age, sex, ethnicity and background, in order to allow the participants to feel as comfortable as possible. There are no set rules regarding the number of participants who take part in a focus group in order to generate reliable data. However, there is general agreement that a focus group should have between six and twelve participants and a group moderator, who facilitates the discussion as well as ensures that all the members of the focus group have an equal opportunity to contribute to the group discussion (Krueger and Casey, 2000). Focus groups were considered to be a very useful tool to explore the range of views of academics and teacher practitioners at different schools of pharmacy across the UK (chapter 4). These focus groups explored the behavioural indicators that describe a particular competency, the clusters as well as the overall structure of the PDF. Finally, after the evaluation of the use of the PDF a focus group was organised with students in one of the schools of pharmacy where the PDF had been used in order to explore their experiences of using the PDF (section 5.4.2).

It was considered important to explore also the views of as many academics and experts in pharmacy and pharmacy education as possible, as well as the views of students in order to develop the PDF. In order to do this, structured focus groups, which will be referred to as workshops in this study, were conducted at different national and international conferences (chapter 4). These allowed the researcher to collect data from a variety of participants who attended the conferences at the same time. Due to the large numbers of participants in a workshop, several groups of five to ten participants were formed (sections 4.2.2, 4.2.3 and 4.5.1).

3.3.3 Surveys

A common way to collect quantitative data is a survey. This research method aims to estimate the characteristics and perceptions of a population based on a smaller sample of that population. Surveys may aim to explore the associations in a study population, and therefore, are called *descriptive surveys* (Bowling, 2002). In this research the survey method was used to evaluate the use of the developed PDF (chapter 5).

When conducting a survey the researcher should start with developing a research tool, comparable to an interview guide, based on for example, literature, own ideas, experiences, or the research team. In order to develop a survey the researcher should write and re-write questions, to ensure clarity and completeness, and organise them into a questionnaire. As a survey encompasses questions, the terms survey and questionnaire are often used to refer to the same thing (Fink, 2009). In order to develop the PDF, both students and experts in pharmacy and pharmacy education were involved in its development. An iterative process was used and the PDF was reviewed after every focus group as well as after the interviews (chapter 4).

Neuman (2006) suggested some things that should be avoided when writing questions: leading; double negative; double barrelled or vague questions; unbalanced responses; jargon and abbreviations; emotional language; issues beyond respondent capabilities and distant future intentions. Additionally, in order to ensure that the questions encompassed in the survey are not interpreted differently by different people, the researcher may choose to pilot the survey in a small set of respondents, similar to those in the final survey (Neuman, 2006). The PDF was piloted with MPharm students present at the British Pharmaceutical Association (BPSA) Annual Conference and changes were subsequently made to ensure the language and terminology was understood by students (section 4.5.1).

The researcher may choose to distribute the surveys via mail, via the internet or in person, depending on the costs, time, aim of the research and issues to be considered (Bowling, 2002; Fink, 2009). There are different types of surveys, and each of them have their own advantages and disadvantages. Whilst structured questionnaires lead to quantitative data, pre-coded response choices may force the respondents to choose inappropriate answers (Bowling, 2002). However, this issue could be addressed by piloting the questionnaire or by attaching an explanation to the pre-coded responses or even using both ways. Mail and web-based questionnaires offer the researcher the possibility to cover a large geographical area but questions should be clear and simple. They are an economical way to collect data in quantitative studies. Whilst allowing the researcher to sample participants from a large geographical area web-based surveys require internet access (Neuman 2006). Other issues with web surveys are concerned with protecting the privacy of respondents and the complexity of the design (Neuman, 2006). A web-based questionnaire was considered the most appropriate way to approach the MPharm students in two universities, whereas in the third university the contact person suggested that a paper copy of the questionnaire was the best way to approach the students. For the universities where the questionnaire was administered via the web, internet access was not considered a problem as it was known that the students had access to the internet whilst they were on campus.

3.3.4 Consensus development methods

Structured group methods, also called consensus development methods could have been chosen in this research to reach consensus or to establish the extent of a consensus regarding the content of the PDF (Murphy et al., 1998; Bowling, 2002; Smith, 2002). It may be difficult to specify acceptable levels of agreement (Fink et al., 1984). The researcher should aim to recruit participants who are not dominant which may be difficult for a researcher who does not know the potential participants. Murphy et al. (1998) suggested that as the discussion may be dominated by some participants, or that the participants may feel pressured to reach consensus or agree with the majority or with the most powerful participant's view, these might be factors that influence the validity and reliability of the findings.

There are three main approaches within this which a researcher can choose from: the Delphi method, the nominal group technique and the consensus development conference (Murphy *et al.*, 1998).

In the *Delphi method*, a questionnaire is sent by the researcher to a sample of expert participants by post or email. The responses are collated and re-sent to the same sample of participants until consensus is reached through a ranking process. The Delphi method allows each of the participants to express their own views, while providing information from the whole sample of participants (Fink *et al.*, 1984). Whilst being a very structured method it has been criticised for not offering the participants the possibility to meet (Murphy *et al.*, 1998). On the other hand this method offers the researcher the opportunity to recruit the sample from any geographical area (Murphy *et al.*, 1998) and the method is not disadvantaged by dominant participants. The method has been used in education and healthcare (Clay-Williams and Braithwaite, 2009; Pfleger *et al.*, 2008). However, group interaction was desired in the process of developing the PDF.

In contrast to the Delphi method, in the *nominal group technique* postal or email questionnaires are not administered, but participants are offered the possibility to meet face to face (Murphy *et al.*, 1998). Similar to the Delphi method, the technique allows participants to express their own ideas, prior to a group discussion, and consensus is reached through an iterative process using ranking (Smith, 2002). The nominal group technique has been applied in education, government and industry (Fink *et al.*, 1984; Perry and Linsley, 2006; Margolis *et al.*, 2009). However, the aim in this study was to have a less structured discussion regarding participants' views about the PDF and its content.

The third possible method to reach consensus is through a *consensus development conference or panel*. The researcher recruits a group of experts in the area of interest to attend a meeting in order to deliberate the subject under discussion (Bowling, 2002). Similar to the nominal group technique, in the consensus development panel the researcher does not administer a postal or email questionnaire but the participants meet. However, in contrast to the nominal group technique, the consensus development panel does not offer participants private

time to express their own decisions before the group discussion takes place. Feedback on the group discussion is not provided and the approach is not structured (Halcomb et al., 2008).

None of the above mentioned methods of reaching consensus was used. In the development of the PDF the aim was to explore the views of a variety of experts in group discussions in the first stages of the development of the PDF, and then to interview individuals in the later stages of the development of the PDF. Furthermore, it was considered that by encouraging group discussion as well as allowing participants to express their own ideas identification of more competencies would be fostered.

3.4 Data handling and analysis

This sections aims to describe the principles for analysing data in both qualitative and quantitative studies with a focus on the approaches used in the present research.

3.4.1 Data handling and analysis in qualitative research

The strategies used to analyse the qualitative data in the present study were content analysis and framework analysis. A grounded theory approach was also considered as a way to analyse data but was not chosen due to reasons indicated below.

The grounded approach aims to develop theories from data that has been systematically gathered and analysed. Thus, the theory is inductively derived from the data (Glaser and Strauss, 1967; Bowling, 2002; Bryman, 2008). However, in this research due to pre-existing ideas of competencies one of the main criteria for a grounded approach, that of being completely inductive, would have not been met. The sample of participants was set at the outset of the research and was not selected as the analysis progressed (Lingard *et al.*, 2008). Thus, this approach was not considered appropriate.

Content analysis is a method of analysing qualitative data by reducing it and identifying core patterns or themes (Krippendorff, 1980; Hsieh and Shanon, 2005; Patton, 2002). Content analysis was used to explore the data from workshops, focus groups and interviews that related to the development of the PDF. It was an appropriate method as the aim was to identify participants' views related to the content of the PDF: behavioural indicators, competencies that they thought should be encompassed in the PDF, as well as their views relating to the grouping of these and the overall format of the PDF. Content analysis allowed the researcher to identify the level of importance given to the different issues raised by the participants, related to the content and format of the PDF. This was done by counting the recurring themes as well as the number of times they were mentioned by the same or different participants, or by a group of people (chapter 4).

Framework analysis allows for rigorous and transparent data management. It provides methodical and observable stages to the analysis process, so it is very clear about the steps by which the outcomes have been achieved from the data (Ritchie & Lewis 2006). The process begins with familiarisation with the data collected. Then themes or issues are identified in the data. The sections of data that belong to a theme are identified and then grouped per themes into charts. Once the charts have been developed the researcher starts to interpret the themes (Ritchie and Lewis, 2003). NVivo (version 2) was used to assist the creation of themes for the sections of the interviews and focus groups that related to participants' views about competence, competency frameworks and their use for the undergraduate programme as well as their recommendations on how to implement such a PDF efficiently in the MPharm degree. Codes were allowed to emerge from the data and grouped into themes and subthemes.

The challenge in analysing qualitative data is in making sense of a great amount of data. In this research, audiotaped data from interviews and focus groups was transcribed before the analysis. The notes taken during the focus groups and workshops were added to these for analysis. As indicated above, the part of the data collected in interviews that related to stakeholders' views on the development of a PDF for MPharm students and its implementation in the MPharm degree NVivo

(version 2), was employed to assist coding. The process continued to reduce the amount of raw data by coding the data and identifying themes. An iterative procedure was used in the coding process. Data collected in focus groups and interviews were transcribed and notes taken during focus groups and workshops were then coded by attaching labels to passages of text and describing what was being said in the passages. Then for the part of the data collected in focus groups and interviews that referred to participants' views on the content and structure of the PDF the labels and descriptions were re-read for more coding and descriptions. In contrast, for the part of the data collected in focus groups and interviews that referred to participants' views of a PDF for MPharm students and its implementation in the MPharm degree, the labels and codes were entered onto NVivo (version 2) for more coding and descriptions. Coding reports were generated with the assistance of the software.

3.4.2 Data handling and analysis in quantitative research

Similarly to qualitative data, computer software may be used to assist with storage and analysis of quantitative data. After entering the coded data onto a database, the data should be checked for outlying values, missing entries, typographical errors and subsequently corrected in the database. A sample of randomly selected cases may be selected in order to be checked for coding errors. If no errors are found the number of coding errors in the whole database may be assumed to be minimal, therefore, the analysis to be reliable.

Different statistical tests may be employed depending on the type of data, the sample population distribution but also on the objectives of the study. Quantitative data include nominal or categorical data, for example gender; ordinal data, for example, self-directedness towards learning; or interval data, for example, age. Nominal or categorical data may be classified into categories, but the categories cannot be ranked or ordered. In contrast, ordinal data may be ranked or ordered; however the distance between the categories cannot be measured. Interval data not only can be ordered, but the distance between the categories can be measured (Bryman, 2008).

Parametric tests are employed to explore interval data, assuming that the level of measurement is at least interval, the distribution of the scores of the population is normal and the variances are the same throughout the data (Field, 2009). In the present study the data were not normally distributed; therefore, parametric tests were not employed. Non-parametric tests are employed for categorical or ordinal data as appropriate. In this research data were not normally distributed, thus, non-parametric tests were employed for the analysis (Figure 5.2). The non-parametric tests usually report the median (Kinnear and Gray, 2004). Statistical significant results were reported for $p \leq 0.05$. Associations between categorical variables were explored by employing the Chi-square test. The *Mann-Whitney U test* was employed to compare two groups of unrelated ordinal data and the *Kruskal-Wallis* test to compare data from three or more groups (Field, 2009). For example, in this research these tests were employed to explore the differences between demographics and the competencies encompassed in each of the clusters (Figure 5.2). If the Kruskal-Wallis test is significant, it should be followed with Mann-Whitney tests in order to identify the groups which are statistically different from one another (Pallant, 2010). A *Bonferroni* correction should be applied to in order to prevent Type I errors, thus, preventing conclusions that there is a statistical significant difference when there actually is none. The more Mann Whitney tests are conducted the more the likelihood for Type I errors (Field, 2009; Pallant, 2010). Thus, the *Bonferroni* correction adjusts the significance value, from 0.05 to 0.05 divided by the number of tests conducted.

In order to explore the strength of the correlation between two ordinal variables *Spearman Rho* may be calculated. Spearman Rho may take values between -1 to +1. A positive correlation indicates that as one variable increases the other variable increases too. In contrast, a negative correlation indicates that as one variable increases the other one decreases (Pallant, 2010; Field, 2009). In this research Spearman Rho was calculated in order to explore the correlations between exam results and the self-assessed competencies in the two clusters as well as to explore the relationships between self-directedness towards learning and the exam performance (Figure 5.2). When the same sample of participants is followed at three points in time the *Friedman test* may be employed in order to explore change

over time (Field, 2009; Pallant, 2010) . This was employed also in this research in order to explore the change over time in students' self-assessed competence (Figure 5.2). If the Friedman test indicates that there is a statistically significant difference between the three time points, a *post hoc* analysis should follow. In this case, *Wilcoxon Signed Rank Test* should be employed in order to identify between which time points there is a statistically significant difference (Field, 2009; Pallant, 2010). In order to control for Type I errors a Bonferroni correction should be applied, thus, dividing the significance level of 0.05 by the number of Wilcoxon Signed Rank tests employed. For example, in this research if the Friedman test indicated that there was a statistical significant difference between students' self-assessed competence over the academic year, three Wilcoxon Signed Rank test were conducted (between time point one and two, time point two and three and time point one and three) (Figure 5.2). Thus, the significance level became $p<0.01$.

3.5 Credibility of research

To ensure the credibility of research findings the researcher should employ appropriate research methods. The researcher has to decide between qualitative and quantitative research methods or to combine the two. The choice of method(s) depends on the research question. By using a mixed methods approach, the disadvantages of one method were complemented by the other method, increasing this way the validity and reliability of the research. Validity and reliability have multiple faces; therefore, it is impossible to remove all threats to validity and reliability from a study, but the researcher should try to minimise them. This was also done in the present research.

3.5.1 Validity

Validity is defined as the ability of a data collection tool, for example a questionnaire or an interview guide, to explore what it is supposed to explore and not something else (Smith, 2002; Creswell and Plano Clark, 2007; Bryman, 2008). In qualitative research leading questions should be avoided during focus groups or interviews to ensure the credibility of research (Lincoln and Guba, 1985; Thomas and Magilvy,

2011). The researcher can clarify questions if not understood by the interviewee. Additionally, the researcher can ask the interviewee to clarify his/her responses if not understood by the researcher. This is not possible in quantitative research. Furthermore, transcriptions play an important role in ensuring that the collected data are accurate reflections of the respondents' perceptions on the subject of the research (Smith, 2002). Credibility is also assured in qualitative research when the researcher reviews the transcripts and looks for similarities across these (Lincoln and Guba, 1985; Thomas and Magilvy, 2011). Additionally, two or more researchers may independently code the collected data as a validity check, and literature may be used as appropriate to support the findings; at the same time, the researcher's claims also need to be plausible in order to be valid (Neuman, 2006; Creswell and Plano Clark, 2007).

Validity of the topic guides and of the PDF was assessed in the present study using face, content and construct validity. In order to develop a data collection tool the researcher considers questions relevant to the research topic, with the help of literature and their own experience related to the research question. Face validity refers to the ability of the researcher to assess the relevance of the questions; the researcher may also discuss the relevance of the questions with other members of the research team. For example, in the present research, the researcher discussed the topics that were included in the topic guides with other members of the research team to ensure that these are relevant to the subject that was going to be discussed.

Content validity ensures that the data collection tool investigates the research topic comprehensively and does not omit relevant issues (Bowling, 2002). For example, a test which aims to assess pharmacy students' knowledge of pharmacology of drugs would not be content valid if the test would focus only on the pharmacology of drug used in hypertension. Similarly, in this research if the aim of a focus group was to review the behavioural indicators and competencies within the PDF, if the topic guide would only include topics related to the behavioural indicators, it would not be content valid. In this research, content validity was ensured by constant reviews of the topic guides for interviews, workshops and focus groups, by the researcher and the other members of the research team. The content validity of the PDF was

ensured by adopting an iterative process in its development as well as by recruiting academics, pharmacy students and stakeholders in pharmacy and pharmacy education to inform its development as experts.

According to Carmines (1979) "construct validity is concerned with the extent to which a particular measure relates to other measures consistent with theoretically derived hypotheses concerning the concepts that are being measured". Construct validity check was planned in the present research (sections 5.6.4.5; 5.6.5.6; 5.6.6.1; 5.6.6.2; 5.6.6.3; 5.6.6.4; 5.6.8).

3.5.2 Reliability

A data collection tool should not only be valid but it should also be reliable. In quantitative research this means reproducibility of the data (Neuman, 2006), whilst in qualitative research this means consistency in collecting, processing and analysing data (Smith 2002) as well as describing in detail the methods undertaken (Thomas and Magilvy, 2011). Reliability is concerned with the precision, consistency and accuracy of a quantitative measure (Sarantakos, 2005). The following methods for testing reliability may be used in quantitative and qualitative research as appropriate.

Internal consistency is concerned with the consistency of the results (Sarantakos, 2005). In quantitative research, when for example, a scale measures a single idea, it is internally reliable, whilst in qualitative research one method of data collection should yield consistent results in order to be internally reliable. Instead of using one item to measure a construct, the researcher may choose to use several items to measure the different aspects of the construct (Neuman, 2006).

Different methods may be employed to test for reliability in quantitative research. One of the methods is called the split-half method; the responses to the items on a scale are randomly split into two halves and compared to see whether they give the same results, so whether they correlate with each other (Carmines, 1979; Neuman, 2006; Bryman, 2012). A correlation coefficient may be calculated; a coefficient of 1

means a total correlation whilst a correlation of 0 is a sign of no correlation. The nearer the value is to 1 the more internally reliable is the scale. The issue with this method is that the results may be split into two in different ways, which may yield to different results.

Cronbach's alpha is another method for testing for the internal reliability of a scale; it is the average of all split-half reliability coefficients (Litwin, 2003; Field, 2009) and can have a value between 0 and 1. This was also calculated in the present research for the items included in the self-directed learning questionnaire. In contrast, Cronbach's alpha was not calculated for the items included in the PDF, as the different behavioural indicators are conceptually different parts of a competency but they are not there to measure the same thing. As above, a value of 0 indicates that there is no correlation and a value of 1 indicates that there is a strong correlation (Kottner and Streiner, 2010). The higher the coefficient is, the more variance it explains. On the other hand, a very high correlation between the items of the scale and a very high internal consistency may indicate that the items in the scale measure the same thing and not different aspects of a construct, thus the scale is consistent. The internal consistency of a scale may also be influenced by the number of the items in the scale (Keszei *et al.*, 2010).

The test-retest reliability is another way of measuring the reliability of an instrument (Carmines, 1979; Litwin, 2003). It is concerned with the stability of the responses given by the same group of respondents at two different time points (Litwin, 2003). The reliability of the instrument is given by the correlation between the responses given in the two time points (Carmines, 1979; Litwin, 2003). As indicated above, the closer to 1 the correlation coefficient, the more reliable the instrument is (Litwin, 2003). However, care should be taken with interpreting the meaning of the correlation coefficient. More specifically, in case change is expected between two administrations of the instrument, a low correlation coefficient might indicate that this change took place, rather than indicating a low reliability of the instrument (Carmines, 1979)

3.5.2.1 Reliability of coding

When there are several researchers or coders exploring the same thing, there should be an agreement when their measures are compared; this is known as inter-coder reliability (Neuman, 2006). In quantitative research this can be tested for by using statistical tests such as, Spearman's rho (Bowling, 2002). The closer to one Spearman's rho is the more reliable the tool is. In qualitative research it is inappropriate to employ statistical tests to ensure the reliability of one researcher's coding but another researcher can check the credibility of the coding (Miles and Huberman, 2002). In this study, the reliability of coding was ensured by an iterative process used in the coding process and another researcher checking.

3.5.3 Bias

The validity and reliability of research findings is threatened by bias (Bowling, 2002). A researcher should carefully design the study, use appropriate data collection methods, appropriate sampling methods and analysis methods to ensure that the results minimise bias.

The study participants may bias the research findings. When asked a question the participants tend to agree rather than disagree (Bowling, 2002). One way to minimise this bias, and to check if the participants are thinking before answering, is to use both positive and negative questions in a data collection tool. Additionally, the study participants may give responses that they think are expected of them instead of expressing their true feelings and perceptions: this is known as the social desirability bias. In order to minimise this, the researcher should assure the study participants that their responses are confidential and should try to create a friendly atmosphere. In an interview situation the researcher should not allow their own perceptions to influence the interviewees by asking leading questions (Bowling 2002). The study participants might become more and more aware of the fact that they are being studied, which might influence their behaviour and their perceptions. The latter is known as the "Hawthorne effect" (Bowling, 2002). This might happen in longitudinal studies, when participants become familiar with the research topic,

and give responses that they think they are expected to give rather than giving responses which reflect their true perceptions and feelings. The participants may also remember and repeat their previous responses. At the same time it should be taken into account that participants' views may change over time. In this study, participants may have learnt what is expected of them, thus, giving the answers they thought the researcher expected of them. However, in order to address this issue, the researcher compared students' self-assessment of their competencies with students' exam results. The above possible bias was discussed in section 5.1.
In interviews interviewees may be asked to convey their perceptions, feelings and experiences, thus bias may arise, as they might not remember or may not want to tell something. However, in this research interviewees were not asked to recall information. Bias may also be introduced by the researcher, but this should be minimised by ensuring that the researcher maintains neutrality and avoids leading questions (Kumar, 1999; Patton, 2002).

3.6 Sampling

In quantitative research the aim is often to have a representative sample from a population; this approach is called *probability sampling* (Ritchie and Lewis, 2003). Ideally, a random sample should be employed in quantitative studies (Neuman, 2006). Whilst ensuring that each member of a population has a chance to be included in the sample, a random sampling also allows the researcher to statistically calculate the relationship between the sample and the population (Neuman, 2006). In order to select a random sample, an up to date list with all the members of the population is required; this is the *sampling frame* (Smith, 2002). Other types of probability samples are *systematic, cluster* and *stratified sampling* (Neuman, 2006). In systematic sampling, for example, every fifth member in a sampling frame may be selected and the sampling would start at a random point between one and five. Cluster sampling is a multi-stage process in which the target population is divided into clusters, randomly select a number of clusters, and within these, randomly select the individuals (Smith, 2002). Stratified sampling is used to avoid the under- or over-representation of certain groups of the population; participants from the groups are then randomly selected (Bowling, 2002).

Whilst being an accurate and cost effective approach to sampling, probability sampling is inappropriate for qualitative research, which focuses less on the sample's representativeness and more on transferability. Qualitative research uses *non-probability sampling* (Neuman, 2006). The most common types of non-probability sampling used in qualitative research are *convenience, purposive* and *snowball sampling* (Bowling, 2002). However, accepting the limitations, they may be used in quantitative studies where appropriate. Due to their complexity qualitative studies are restricted to small samples (Smith, 2002). Small sample size may not be a limitation as in qualitative studies the researcher is allowed to conduct detailed work on the appropriate sample size in order to meet the objectives of the research. Snowball sampling is used when it is difficult to identify possible respondents. In snowball sampling, participants are asked by the researcher to identify others who belong to the target population. The number of participants increases with every new participant. This approach to sampling was not needed as the potential respondents were not difficult to identify.

In convenience sampling the researcher may choose to sample the participants from an accessible population in order to facilitate recruitment and increase their participation (Bowling, 2002). However, convenience sampling is likely to be unrepresentative of the population and may introduce bias (Smith, 2002); moreover it is neither purposeful nor strategic (Patton, 2002). Nevertheless, it can be useful in providing insights in terms of preliminary exploratory research (Smith, 2002). In the present study a convenience approach to sampling was considered appropriate to recruit the different universities as the members of the research team were based at these universities or had links to these universities.

Purposive sampling approach is recommended by most writers in qualitative research (Bowling, 2002; Bryman, 2008). The researcher samples participants with certain characteristics relevant to the study. Purposive sampling was considered the most suitable approach to sampling for the following participants in the present study:

- pharmacy students to involve them in the development of the PDF. It was considered to be important to involve pharmacy students in the

development of the PDF as the PDF was going to be designed for them. The International Pharmaceutical Students' Federation Congress (IPSF) and the British Pharmaceutical Students' Association (BPSA) were unique opportunities to get pharmacy students together at the same time and place and explore their views;

- pharmacy academics participating at the International Social Pharmacy Workshop (ISPW) to explore their views on competencies pharmacy students develop or should develop during their undergraduate degree;
- participants of the focus groups organised in universities A,B and C. It was aimed to organise a focus group in each of the universities that agreed to participate in the study;
- experts in pharmacy and pharmacy education representing the different areas of pharmacy, pre-registration tutors and policy makers in pharmacy education in order to explore their views on the development of the PDF;
- experts in developing educational programmes in order to explore their views about the design and format of the PDF;
- third and fourth year pharmacy students in order to evaluate the use of the PDF;
- pharmacy academics at university A to support students with using the PDF;
- students who had used the PDF to explore their views on its use and effectiveness.

4 DEVELOPMENT OF THE PROFESSIONAL DEVELOPMENT FRAMEWORK

This chapter will describe the process of development of the PDF. It will include a description of the methods used and how the final version of the PDF evolved.

The aim of this phase of the research was to develop a PDF by:

- Identifying competencies and behavioural indicators required of MPharm students through reviewing relevant literature and soliciting the views of relevant stakeholders;
- agreeing which of the identified competencies and behavioural indicators should be encompassed in the framework; and
- developing and designing a final version of the PDF to be administered to students for self-assessment.

A detailed description of the methods used in the development of the PDF in general and what informed the development of new versions of the PDF in a staged approach will be presented. The development of the PDF was informed by the literature, a series of workshops, focus groups and individual interviews. The purpose and the sequence of the work undertaken to develop the PDF are presented in Figure 4.1.

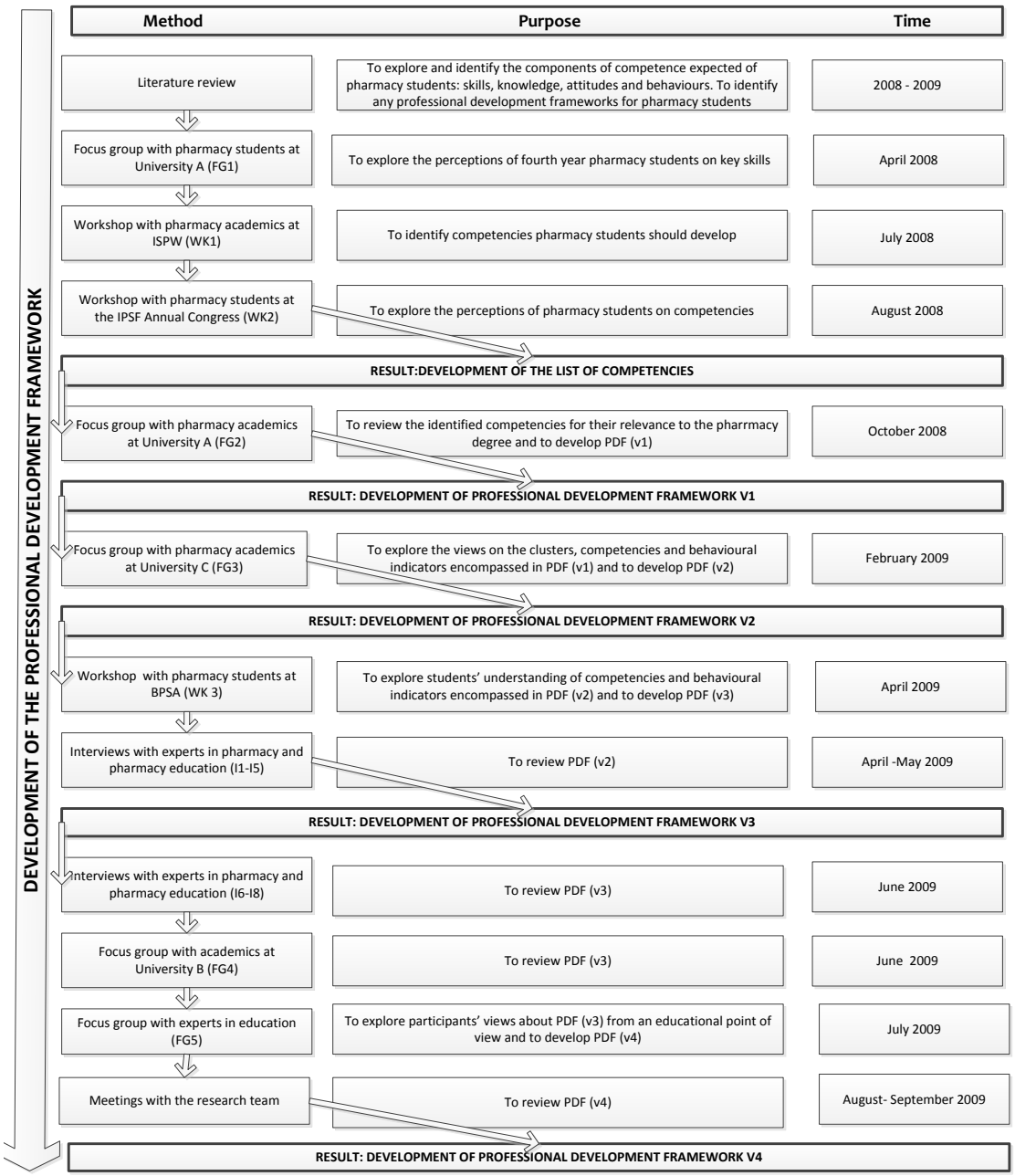

Figure 4.1 The purpose of the different methods used in the development of the different versions of the PDF

The development process involved an iterative process of consultation with pharmacy academics, students and other stakeholders in five stages (Figure 4.1).These participants recommended many changes. The changes recommended in the earlier stages of the development of the PDF were straightforward and were taken into account in the development of the next version of the PDF. Those which required more thought and clarifications were taken into account in the later stages of the development process. This also ensured the content and face validity of the development of the PDF (section 3.5.1). Figure 4.2 shows how the earlier versions of the PDF informed the development of later versions.

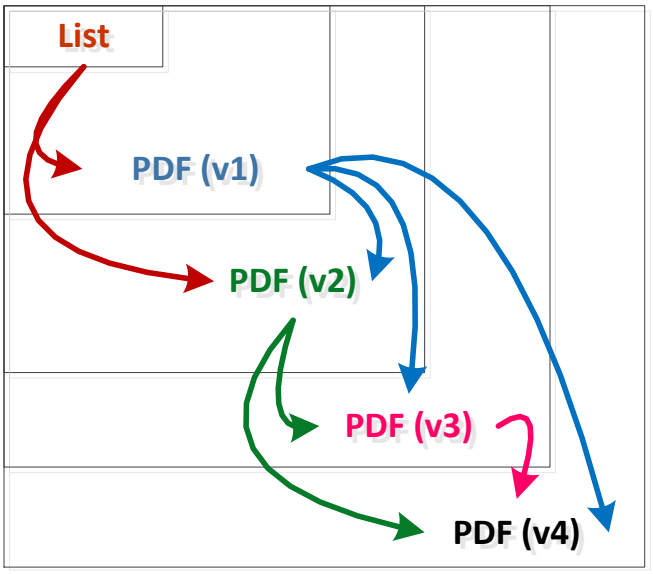

Figure 4.2 The way in which each of the versions of the PDF informed the development of later versions

The changes recommended by participants in focus groups and workshops were grouped in 12 main categories as described in Table 4.1. These terms will be used in the later sections.

Table 4.1 Categories of changes

Type of change	Example
Change of terminology in behaviour description for clarification	In the behavioural indicator "I adhere to dress code (written and unwritten) at University and when going on placements" change "dress code" to "professional appearance". PDF (v2)
Move behavioural indicator to a different competency	Move behavioural indicator "give feedback to others" from competency "reflective practice" to competency "interpersonal". PDF (v3)

Move competency under a different cluster	Move the competency "planning" from the "personal management "cluster to the "study abilities" cluster. PDF (v3)
Change of competency title for clarification	"Pharmacology" competency was considered a misleading title as it was not about underpinning knowledge but about applied knowledge, thus it was recommended to be changed. PDF (v3)
Merge competencies/ clusters	Competencies encompassed in the "study abilities" cluster overlap with the "time management" competency, therefore, the competencies should be merged "Personal management and problem solving" cluster overlaps with the "interpersonal" cluster, therefore, the two clusters should be merged. PDF (v3)
Split one behavioural indicator for clarification	Breakdown the following behavioural indicator from the pharmacy abilities cluster "I am able to explain and understand the concepts of pharmaceutical equivalence, bioequivalence and therapeutic equivalence", , into three behavioural indicators. PDF (v2)
Review order of behavioural indicators in the competency	Reorder behavioural indicators encompassed in communication, interpersonal cluster. PDF (v2)
Review order of competencies in the cluster	Review order of behavioural indicators and competencies within the "interpersonal" cluster. PDF(v3)
Review order of clusters in the PDF	Interpersonal cluster should be moved to the end of the PDF. PDF (v2)
Addition of behavioural indicator to existing competency	Addition of drug-patient interactions and drug-disease interactions to the pharmacology competency within the pharmacy abilities cluster. PDF (v3)
Addition of new competency to cluster	Study abilities cluster should encompass competencies related to statistics and research skills. PDF (v1)
Condense competency/ cluster	Personal management and problem solving cluster should be condensed; The competency called planning, within the personal management cluster should be condensed. PDF (v3)

4.1 Recruitment of participants

This section will describe the recruitment of participants in the different workshops, focus groups and interviews conducted to develop the PDF.

4.1.1 Recruitment of participating schools of pharmacy

Four schools of pharmacy were recruited to take part in the research. The schools of pharmacy will be referred to as University A, B, C and D. Some of the members of the research team were based at these universities. Therefore, their support was sought in order to recruit their respective universities to the study. Another ly member of the research team was based at University D.; however, subsequently this university withdrew its participation. Members of staff were recruited to participate in the development of the PDF in the three universities. Ethical approval has been obtained from University A (Appendix 1 and 2). An ethical approval in the other two universities was not needed, as an ethical approval had already been obtained at University A. All of the universities were based in England and were established before 2003.

4.1.2 Recruitment of participants in the workshops, focus groups and interviews

Participants recruited to take part in the different stages of the development of the PDF will be described in in the following sections (4.2.1 to 4.2.3; 4.3.1; 4.4.1; 4.5.1; 4.5.2; 4.6.1 to 4.6.3), according to the order described in Figure 4.1.

4.2 Developing a list of competencies

The development of the PDF was started through a review of the curriculum of the MPharm degree courses in the potential participating schools of pharmacy. The pre-registration trainee booklet 2007-2008 was also used in order to identify the competencies required of graduated MPharm students and the ways in which these could be described and defined in the PDF. Additionally, a literature search was done on competency frameworks for pharmacy students. However, no such

frameworks have been identified in the literature. At this stage the competencies comprised descriptors, which became behavioural indicators as the PDF was developed further. A summary of the identified competencies is presented in Table 4.2. The identified competencies were then used as a basis for the first focus groups with pharmacy students and academics (Figure 4.1).

First the participants and the methods used in each part of the development process will be described, and then the findings, before moving on to the next part.

4.2.1 Focus group with pharmacy students at University A

Pharmacy students in their final year at University A in the academic year of 2007-2008 were recruited to participate in focus group one (FG1). Purposive sampling was used as these students could be considered to be experts on key skills they were expected to have developed throughout the four years of their MPharm programme. Any of the 115 final year students could have participated in FG1. The target was to recruit a pool of 16 students due to possible attrition. A recruitment announcement to the students was set up on the virtual learning environment together with an information sheet. Students were given a week to volunteer to participate. After a week only three students had volunteered, therefore, an email was sent to all fourth year students and a final announcement was made at a lecture that all fourth year students were expected to have attended.

A topic guide was developed by the researcher together with another member of the research team (Appendix 3). FG1 was conducted jointly as part of the present research as well as part of another research project. Therefore, the topic guide also encompassed topics relevant for the other research project. For the purpose of the present research, the aim was to explore students' perceptions on key or transferable skills they would have liked to have developed or had developed during their MPharm programme. Other topics were related to students' views on how they would develop these key skills, how would they use them, when would they be useful and how useful they were. The topic guide was reviewed for its face validity by a third researcher. All three researchers agreed on the topics encompassed in the topic guide. The researcher identified 28 skills in the literature. These were reviewed

by two other researchers, who added four more skills. As this focus group was also part of another research the 28 skills were not all relevant for the present research. A small group exercise was also included in the topic guide. The researcher prepared materials for the exercise. Students were given post-it notes with skills written on them and asked to discuss where in the MPharm programme they had practised those skills or where they should be developed.

Students who attended the focus group were asked at the beginning to give informed consent for their participation and for the recording of the focus group. During the FG1 participants discussed the topics encompassed in the topic guide facilitated by one of the researchers while another researcher took notes. After this, students were divided into two groups for the group exercise, which all three researchers facilitated. The focus group with students was followed by a workshop with academics, which is further described.

4.2.2 Workshop with pharmacy academics at the International Social Pharmacy Workshop

A workshop (WK1) was conducted at the International Social Pharmacy Workshop (ISPW) 2008 to explore the perceptions of international pharmacy academics on the competencies that pharmacy students should develop in order to widen the UK perspective on competencies. The WK1 was possible to arrange as the ISPW encompasses an educational day, in which topics related to pharmacy education are discussed. Purposive sampling was used as these academics potentially know what competencies pharmacy students are required to develop and at what required level. While any of the 120 conference participants from any country could have participated, the aim was to recruit around 20 participants. The workshop abstract, a form of an information sheet, was presented in the conference booklet. Additionally, participants were asked at the beginning for their informed consent.

A topic guide was developed by the researcher for the WK1 to facilitate participants to discuss perceived competencies pharmacy students develop or should develop during their degree and also in which year of the degree those should be developed (Appendix 4). The topic guide was reviewed by two other researchers for its face

and content validity. The researchers agreed on the above mentioned topics and added also two more topics, related to the length of the course in participants' home countries and to participants' views about the year of the university they thought the competencies identified during WK1 should be developed. The latter were suggested in case there was any time left at the end of the workshop.

Ten competencies often encountered in the literature were selected to be used as the basis of the discussion in the workshop. Participants were provided with a list of these ten competencies, and were asked to select and rank the four most important competencies they thought pharmacy students should develop. Participants were also asked to elaborate why they had ranked the competencies in a particular order. Basic demographics were collected from participants (Appendix 5). The topic guide developed for this workshop was previously discussed with the other two researchers to ensure that data was collected in a consistent way. In the workshop, participants were divided into four groups, two groups of four and two groups of five participants, and were facilitated by three researchers. The groups were facilitated as follows: one researcher with one group, another with another group and the third with two groups. The other two researchers were experts in competencies and competency frameworks. The researcher asked participants to take notes of their discussions. The workshop with academics was followed by a workshop with pharmacy students at the International Pharmaceutical Students' Federation (IPSF) Congress which is further described.

4.2.3 Workshop with pharmacy students at the International Pharmaceutical Students' Federation Congress

A workshop (WK2) was conducted at the IPSF Congress 2008 to gather information on perceptions of competence from pharmacy students from across the world. Of the approximately 170 participants, any student in any year of a pharmacy course who attended the congress could have participated in the workshop. The aim was to have around 60 participants. A brief description of the workshop was presented in the congress folder, a form of an information sheet, and at the beginning of the workshop. Participants were asked at the beginning if they agreed to take part in a research workshop.

A topic guide was developed by the researcher to facilitate participants to brainstorm on perceived competencies they had developed or should develop during their pharmacy degree, how they would develop these competencies and how to ensure a professional development framework would be useful in their development (Appendix 7). The topic guide was reviewed for its face validity by two other researchers who agreed with the topics encompassed in the topic guide. Basic demographics were collected from participants (Appendix 8). Additionally, the topic guide was discussed with the other two researchers who helped to facilitate WK2, to ensure that the data were collected in a consistent way.

Participants were divided into four groups; two groups of eight, a group of six and another group of nine participants. The four groups were facilitated by three researchers as follows: the main researcher facilitated two groups and each of the other two researchers who were experts in competencies facilitated one group each. Participants were also asked to take notes of their discussions.

The data collected during FG1, WK1 and WK2 were used to develop a list of competencies in addition to the competencies identified in the literature.

4.2.4 Results: Development of the list of competencies

Eighteen students attended FG1, whilst 18 conference participants attended WK1 and 31 attended WK2.The majority of the participants at WK1 (15/18) were female, pharmacists (16/18) and worked in academia (13/18). The majority of the participants at WK2 were female (24/31) and 28/31 were pharmacy students, two were undertaking their pre-registration year and one was studying at PhD level. Participants at WK2 were from five continents and more than 15 countries. Participants in FG1 and the workshops (WK1; WK2) agreed with the universities handbooks and pre-registration book (Table 4.2). Furthermore, participants added four more competencies to the list which related to conflict management, dealing with ambiguity, creativity and innovation, and adaptability. The developed list of competencies is shown in Table 4.2

Table 4.2 The list of competencies identified through the universities handbooks, pre-registration trainee book and FG1, WK1 and WK2

Competencies	Descriptors	Source
Problem solving	• Identifies problems • Gathers information (access information, summarises information, having up-to-date information) • Analyses information (evaluates information, identifies problems) • Determines possible solutions • Actively works to resolve the issues	• University A. Student Handbook 2007 • University C. Skills for research in Life • University Y. Student Handbook 2005-2006 • Preregistration Trainee Workbook 2007-2008 • WK1; FG1
Team working	• Works with other pharmacy undergraduate students • Works in multidisciplinary undergraduate students teams • Actively participates as a member of a team in completion of goals	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Preregistration Trainee Workbook 2007-2008 • Wk1; Wk2; FG1
Interpersonal skills	• Ability to interact effectively with patients, the public and healthcare professionals • Ability to develop and maintain effective relationships with others	• Preregistration Trainee Workbook 2007-2008 • Wk1; Wk2
Decision making	• Identifies the most appropriate solution and justify the decision taken • Ability to use effective approaches for choosing a course of action or developing appropriate solutions and/or reaching conclusions • Ability to take action consistent with available facts, constraints, and anticipates consequences	• University A. Student Handbook 2007 • Preregistration Trainee Workbook 2007-2008 • FG1
Professionalism	• Respects confidentiality • Recognises own limitations • Shows confidence • Has an ethical attitude	• Preregistration Trainee Workbook 2007-2008; • Wk1; Wk2; FG1
Numeracy	• Ability to calculate dose and dosage regimens	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Wk1; FG1
Information technology skills	• Word processing, database use, archiving data and information, internet communication	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Wk1; FG1
Time management and organisation	• As evidenced by the ability to plan and implement efficient and effective modes of working	• University C. Skills for research in life • Wk2; FG1
Data handling and analysis	• Acquisition, interpretation and critical evaluation of data	• University A. Student Handbook 2007 • University Y. Student Handbook 2005-2006 • Wk2
Conflict management	• Anticipates or sees to solve confrontations, disagreements or complaints in a constructive manner	• Wk2; FG1
Critical appraisal Critical thinking/	• The mode of thinking in which the thinker improves his/her thinking by	• University A. Student Handbook 2007

academic thinking	analysing (identify the purpose), assessing (check it for clarity, accuracy, precision, relevance, depth, breadth, significance, logic and fairness), and reconstructing it	• University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Wk1; FG1
Deal with ambiguity	• Ability to deal successfully with uncertain situations	• Wk1
Ability to be independent	• Ability to do things on your own, being able to know your capabilities	• University Y. Student Handbook 2005-2006 • Wk1; wk2
Initiative	• Ability to act first, a first move in doing something, a fresh approach to something	• University A. Student Handbook 2007 • Wk2
Leadership	• Ability to influence others to accomplish an objective	• University C. Skills for research in life • Wk1; wk2
Independent learning skills (as preparation for lifelong learning/continuing professional development)/ study skills	• Being able to find the ways of learning that suit you best • Ability to take personal responsibility of own learning , developing a foundation for subsequent CPD	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Fg1
Professional practical skills	• Ability to apply to practice settings the knowledge and understanding required to meet the needs of patients and other healthcare professionals	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Wk1; wk2; FG1
Analytical skills	• Ability to pay attention to detail	• University Y. Student Handbook 2005-2006 • Wk2
Creativity and innovation	• Ability to develop innovative ideas that provide solutions to different situations	• Wk2; FG1
Adaptability	• Ability to deal with changes	• Wk2
Reflective practice	• Ability to think about what and how you have done, what you have done right and what you have done wrong, and what you can improve	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Wk1; wk2; FG1
Written communication	• Ability to communicate with peers and other healthcare professionals in writing	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Preregistration Trainee Workbook 2007-2008 • Wk1; wk2; FG1
Oral communication	• Ability to communicate orally with patients, peers and other healthcare professionals	• University A. Student Handbook 2007 • University C. Skills for research in life • University Y. Student Handbook 2005-2006 • Preregistration Trainee Workbook 2007-2008 • Wk1; wk2; FG1

The sections in this chapter related to the different versions of the PDF are presented and the recommendations of participants with regard to each of the

clusters included in each version of the framework are discussed. Each section will first describe the methods and then the results.

The following sections (4.3 to 4.6) describe the development of the different versions of the PDF. The development of PDF (v1) was based on the list of competencies developed in this stage of the development process (Figure 4.1).

4.3 Development of PDF (v1)

The resultant list of competencies (section 4.2) was used to form the basis of a focus group (FG2) with academics at University A, who discussed which of the competencies in this list should be encompassed in the PDF (v1).

4.3.1 Focus group with academics at University A

The FG2 was conducted to review the list of competencies, and identify any other ones MPharm students are required to develop during the MPharm programme. Purposive sampling was used to recruit pharmacy academics from different subject areas at University A. The course director was consulted to determine which of 56 members of staff at University A might be interested in educational issues and participating in this focus group. They were given a week to volunteer. Ten academics were subsequently contacted in person by the researcher and then emailed a recruitment letter (Appendix 9), an information sheet (Appendix 10) and a consent form (Appendix 11). Those who agreed to participate were emailed the list of the identified competencies (Table 4.2), to offer the participants the opportunity to familiarise themselves with the topic before the focus group and to ensure that the participants would able to work efficiently.

A topic guide for FG2 was developed by the researcher to facilitate the discussion about additions, deletions and changes to the list of identified competencies the participants thought necessary and about how to group or cluster the competencies in the list provided (Appendix 12). The topic guide was reviewed for its face and content validity by two other researchers, who agreed on the topics

encompassed in the topic guide. Participants were asked for their informed consent for their participation in and recording of the focus group at the beginning of it.

In the FG2 participants were divided into four pairs. Two pairs discussed additions, one pair changes and the other pair deletions to the given list of identified competencies. In accordance with the topic guide, general discussion was facilitated by two researchers, one of whom directed the discussion and the other took notes. Any notes made by the academics were collected at the end to ensure that all opinions would be taken into account in the development of the PDF.

Data from this focus group together with other documents and articles identified in the literature (section 4.2.2) were used to review the list of identified competencies (Table 4.2) in order to develop PDF (v1).

4.3.2 Results

Eight of the ten academics approached at University A agreed to participate at FG2 and reviewed the list of identified competencies (section 4.2). These academics represented different subject areas: three from pharmaceutics; three from medicinal chemistry; one from pharmacy practice; and one from pharmacology. Recommendations for additions, deletions and changes to the list of competencies to develop the first version of the PDF were first discussed in pairs and then as a group. Participants in this focus group recommended the following:

1. Twenty competencies should be maintained in the list;
2. Eleven competencies needed to be added;
3. Five competencies should be deleted; and
4. Eighteen descriptors should be changed (at this stage some of the items encompassed in the list of competencies were considered to be descriptors rather than competencies or behavioural indicators).

Ten out of the eleven competencies suggested for addition were taken into account whilst one (directed innovation) was considered to be included in other competencies and thus, not taken into account (Table 4.3) when developing PDF (v1).

Table 4.3 Recommended additions to the list of competencies

Competency	Was the recommended addition taken into account?	PDF in which changes were taken into account
Acting on reflection	Yes	PDF (v1)
Active listening	Yes	PDF (v1)
Numeracy, algebra: understanding, context related to subjects (i.e. deciding dosage regimen)	Yes	PDF (v1)
Health assessment	Yes	PDF (v1)
Grammatical skills	Yes	PDF (v1)
Make evidence based decisions and recommendations	Yes	PDF (v1)
Inter-professional networking	Yes	PDF (v1)
Critical appraisal	Yes	PDF (v1)
Continuing professional development	Yes	PDF (v1)
Other forms of communication	Yes	PDF (v1)
Directed innovation	No	-

The changes recommended by participants at FG2 are shown in Table 4.4. Due to the short time interval between the data collection points, some changes were not taken into account at this stage but at later stages of the development of the PDF (Figure 4.2).

Table 4.4 Recommended changes and deletions to the list of identified competencies

Description of the type of change	Number of changes recommended	Number of times the recommended change was suggested	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in descriptor for clarification	9	9	9	PDF(v2)
Add descriptor to existing competencies	9	9	9	PDF (v2)
Move descriptor under a different competency	3	3	3	PDF(v2)
Merge descriptors	6	6	6	PDF(v2)
Delete	5 4 competencies 1 descriptor	-	5	PDF(v2)

Additionally, participants in FG2 suggested that the competencies could be grouped in the following clusters:

1. Communication
2. Problem solving and decision making
3. Team working and interpersonal skills, including conflict management
4. Professionalism including risk assessment
5. Analytical thinking.

4.3.3 Development of PDF (v1): further work

The list of competencies (Table 4.2), the recommendations of FG2, three policy documents and two tools developed by the learning and teaching departments at two universities were reviewed to support the development of PDF (v1) (Table 4.5). The descriptors from the list of identified competencies were developed into behavioural indicators, which were grouped into competencies, which in their turn were grouped into clusters in PDF(v1) (section 1.3.4).

Competency standards have been identified in the literature for pharmacists but not for pharmacy students. One such set of standards developed were the Thai Pharmacy Competency Standards. The Australian and Canadian standards for pharmacists and the American educational outcomes have been reviewed to support the development of the Thai Pharmacy Competency Standards (Kapol *et al.*, 2008). In contrast with the Australian (Pharmaceutical Society of Australia, 2003), and Canadian (National Association of Pharmacy Regulatory Authorities, 2007) standards, the Thai standards were developed to support not only the professional practice of pharmacists but also used as basis for the registration exam and to support the review and development of curricula in the schools of pharmacy (Kapol *et al.*, 2008). The Thai Competency Standards described in more detail what is meant by the different general standards, and it was thought these would support students in understanding what is required of them. The research team decided the content and phrasing of the standards included in the Thai Competency Standards were appropriate to use in the development of the PDF. The content and structure of the GLF (Antoniou *et al.*, 2005) were reviewed as well. While the content of the GLF was considered to be of too high a level for the undergraduate programme, it

was important to review its contents to ensure consistency. On the other hand, it was considered important for the PDF to have a similar format to the GLF in order to provide consistency in the development of individuals. The policy documents represented key documents in the development of pharmacy degree courses, thus, the research team considered it was important to take them into account in the development of the PDF. The policy documents supported the development of the Pharmacy Abilities cluster whilst the other documents were used to develop the other three clusters (Study Abilities, Interpersonal and Management/planning and organisation-self-management skills) (Table 4.5). In total 29 behavioural indicators were adapted from a validated tool aimed to assess the behavioural professionalism of pharmacy students (Hammer Purkerson *et al.*, 2000). The research team decided to adapt some of the behaviours described in the article by Hammer Purkerson et al. (2000) as the language used was student friendly. Additionally it was considered that some of the behavioural indicators encompassed in this tool would support the development of the more generic competencies encompassed in the PDF. Furthermore, as the PDF was designed for the pharmacy undergraduate degree, it was considered that the framework should also encompass a cluster, Pharmacy Abilities, that focuses on pharmacy specific competencies.

Table 4.5 Number of descriptors adapted from the documents used to support the development of PDF(v1).

Type of document	Source	Number of descriptors adapted from document	Cluster
Policy document	Pharmacy subject benchmarks (Quality Assurance Agency for Higher Education, 2002)	1 5	Study abilities Pharmaceutical abilities
	Accreditation of the UK pharmacy degree courses (Royal Pharmaceutical Society of Great Britain, 2002)	12	Pharmaceutical abilities
	Thai competency standards (Thai Pharmacy Council, 2002)	5 3	Study abilities Pharmaceutical abilities
Learning and teaching	(Centre for the Advancement of Learning and Teaching, 2010)	3 3 9	Interpersonal Management(planning) and organisation/self-management Study abilities
	(Learning and Teaching Committee. University of Bath, 2007)	5	Interpersonal
Research article	(Hammer Purkerson *et al.*, 2000)	13 7 9	Interpersonal Management(planning) and organisation/self-management Study abilities
		Total 75	

The draft framework, PDF(v1) resulting from this stage of development consisted of 92 behavioural indicators and 19 competencies organised in four clusters (Interpersonal, Management (planning) and organisation/self-management, Study abilities and Pharmaceutical abilities) (Appendix 13). The identified list of competencies underwent major changes in order to develop it to PDF (v1). As previously mentioned the list of competencies included competencies and a brief description. However, based on the outcomes of FG2 and the findings in the above mentioned sources, the list of competencies was developed into a framework, which encompassed behavioural indicators grouped into competencies, which were grouped themselves into clusters. PDF (v1) was reviewed by the participants at FG3 in order to develop PDF (v2) (section 4.4).

4.4 Development of PDF (v2)

The resultant PDF(v1) (section4.3) was then used to form the basis for FG3 with academics and practising pharmacists at University C, to develop PDF(v2) (Figure 4.1).

4.4.1 Focus group with academics and practising pharmacists at University C

As at University A, the course director was consulted to determine which of the 89 academic members of staff at University C, might be interested in educational issues and in participating in FG3.Purposive sampling was used to recruit academics and practising pharmacists (section 3.6). Nine academics and practising pharmacists were subsequently contacted by email by the course director, who forwarded them a recruitment email (Appendix 9), an information sheet (Appendix 10), and a consent form (Appendix 11) on behalf of the researcher. They were given a week to volunteer. Those academics and practising pharmacists who agreed to participate in FG3 were subsequently emailed PDF (v1), to allow them time to become familiar with it before the focus group.

A topic guide was developed by the researcher to facilitate participants' discussion around whether the competencies in PDF (v1) were relevant to pharmacy students and to identify any other relevant competencies; to discuss whether the listed behavioural indicators described the appropriate competence and to suggest any changes to competencies and behavioural indicators they thought necessary. The topic guide was reviewed for its face and content validity by another researcher who agreed with the topics encompassed in the topic guide.

Participants were asked to give informed consent for their participation in and recording of the focus group at the beginning of it. In contrast with participants in FG2 the participants worked as one group and their notes were collected to ensure that all their perceptions would be taken into account during the subsequent analysis. The researcher also took notes during the focus group.

4.4.2 Results

All nine academics and practising pharmacists contacted at University C participated in FG3. Eight of them represented pharmacy practice, whereas one represented medicinal chemistry. They suggested the following recommendations:

1. Sixty-six out of the 93 behavioural indicators reviewed required no change;
2. One competency and 23 behavioural indicators could be removed from the framework;
3. One behavioural indicator represented two separate issues and should be split into two; and
4. Fifty-four behavioural indicators needed to be added.

Additionally, participants in this focus group perceived that behavioural indicators encompassed in the interpersonal, management and organisation and the study abilities clusters were too general and that they should focus more on pharmacy undergraduate students and be expanded. Moreover, participants perceived that the behavioural indicators in the pharmaceutical abilities cluster should focus more on patient care and the development of a pharmaceutical care plan, and therefore, recommended the addition of behavioural indicators that focused on these. This might be due to the fact that the majority of the participants were representing pharmacy practice. A summary of the changes recommended and subsequently made by the research team will be discussed in turn in the following subsections (sections 4.4.2.1 to 4.4.2.4).

As the PDF was going to be used by pharmacy undergraduate students, it was thought that they might be more inclined to perceive the PDF as part of their development, and addressed personally to them, if the behavioural indicators were phrased in the first person singular. So, the way the behavioural indicators were phrased was changed from third to first person singular.

4.4.2.1 Refinement of the interpersonal cluster

The interpersonal cluster in PDF (v1), which participants in FG3 reviewed, comprised six competencies and 30 behavioural indicators. Participants in FG3 suggested 35 changes to this cluster with some behavioural indicators requiring more than one change (Table 4.6). Participants in FG3 advised that most of the behavioural indicators required changes of terminology to clarify their meaning (Table 4.6). The research team reviewed all the recommendations and decided that further investigation was needed to determine if three of the recommended changes in the terminology of the behavioural indicators and two recommended additions of behavioural indicators were supported by other stakeholders. Therefore, they were not taken into account at this stage, but at the later stages of the development of the PDF. Some other recommendations were not taken into account at all.

Table 4.6 Recommended changes to the PDF (v1) for the interpersonal cluster and their confirmation by the research team

Description of the type of change	Number of changes recommended	Number of times the change was suggested	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	15	26	13 2 not taken into account	PDF (v2)
Merge behavioural indicators/ competencies	5 2 behavioural indicators 2 competencies	7 of which 5 behavioural indicators 2 competencies	3 1 1 not taken into account	PDF (v2) PDF (v4)
Split one behavioural indicator into two for clarification	1	1	1	PDF (v2)
Add behavioural indicators to existing competencies	14	21	9 1 4 not taken into account	PDF (v2) PDF (v4)
Total	35	55	26 4 7 not taken into account	PDF(v2) PDF(v4)

One of the behavioural indicators that was recommended to be merged with another was deleted as after making changes to other behavioural indicators and competencies it was considered that the behavioural indicator would overlap with others (Table 4.6). It was considered that four of the behavioural indicators

recommended to be added were not relevant to the undergraduate degree, therefore, they were not taken into account (Table 4.6).

Participants in FG3, previous workshops (WK1 and WK2) (section 4.2) and the research team considered that the interpersonal cluster should encompass more core, transferable skills that may apply across any profession, but which are important in the daily practice of pharmacists. Thus, it was decided that the transferable competencies in this cluster should be adapted to and focus on pharmacy undergraduate students.

Furthermore, participants in FG3 perceived that the communication competency related to many behavioural indicators across the PDF. Therefore, this issue was further discussed with other academics (section 4.6.2), students (section 4.5.1) and stakeholders (sections 4.5.2 and 4.6.1) in order to develop PDF (v4). The communication competency was then phrased in a way that showed its applicability across all the behavioural indicators in the framework.

Two of the recommendations of changes in terminology and two of the recommendations of additions of behavioural indicators to an existing competency were not taken into account at all as it was considered that they were not appropriate for the undergraduate level. Also, it was decided that they would be better understood as they were.

4.4.2.2 Refinement of the management and organisation cluster

The management and organisation cluster contained three competencies for which participants recommended a total of 11 changes. They recommended three changes to three out of the 12 behavioural indicators encompassed in this cluster (Table 4.7). Similar to their thoughts about the interpersonal cluster, participants perceived that the management and organisation cluster encompasses transferable skills required from students in general. As before, the research team decided that transferable competencies were relevant to pharmacy undergraduate students and that more work was needed to be done to adapt them for the MPharm degree.

Table 4.7 Recommended changes to the PDF (v1) for the management and organisation cluster and their confirmation by the research team

Description of the type of change	Number of changes recommended	Number of times the change was recommended	Number of recommended changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	5	9	5	PDF (v2)
Add of behavioural indicators to existing competencies	8	11	8	PDF (v2)
Move competency under a different cluster	1	2	1	PDF (v2)
Total	14	22	14	PDF(v2)

Participants also suggested a number of names for the management (planning) and organisation /self-management cluster:

- planning and organisation/self-management;
- planning and organisation;
- planning, organisation and accountability;
- self-management;
- management of self.

As participants could not agree on one name for this cluster, the research team decided to keep the name of the cluster as it was and to further explore the options for the name of this cluster.

4.4.2.3 Refinement of the study abilities cluster

Changes were recommended for five of the eight competencies in the study abilities cluster and it was suggested that five additional competencies should be included in this cluster to reflect research skills, and processing and analysing data. Fourteen changes were suggested to five behavioural indicators out of 30. The research team decided that some of the recommended changes needed to be further explored in order to decide upon which changes should be made and how, thus, 12 recommended changes (Table 4.8), were acted upon in the development of PDF(v4) after the interviews with stakeholders (section 4.6).

Similarly to the interpersonal, and management and organisation clusters, participants perceived that the study abilities cluster encompassed generic, competencies required by any undergraduate not only by pharmacy undergraduates . As the PDF was developed for MPharm students it was considered that the more generic competencies should be adapted for MPharm students. Some changes of terminology recommended were considered to be too detailed for the purpose of the PDF, thus, they were not taken into account (Table 4.8).

Participants suggested moving the reflective practice competency from this cluster to the ethical behaviour competency, under the "interpersonal" cluster. Further exploration of this issue with stakeholders (sections 4.5 and 4.6) indicated that as continuing professional development is compulsory for pharmacists the PDF should also emphasise its importance. Thus, in the development of PDF(v4), the reflective practice competency was removed from the "study abilities" cluster and a new competency that focused on continuing professional development was created in the "Professional Competencies" cluster.

Four out of the 11 behavioural indicators recommended for addition were considered to be at a higher level, not attainable for the undergraduate students, therefore, the recommendations were not taken into account.

It was decided to merge the "produces quality work" competency with another competency instead of deleting it, as recommend by participants, as it was thought the competency was important for the undergraduate level.

Table 4.8 Recommended changes to the PDF (v1) for the study abilities cluster

Description of the type of change	Number of recommended changes	Number of times the change was recommended	Number of changes taken into account(number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	11	12	3 (3 times) 6 (7 times) 2 (2 times) not taken into account	PDF (v2) PDF (v4)
Move behavioural indicator under a different competency	2	4	1 (1 time) 1 (3 times) not taken into account	PDF (v2)
Merge behavioural indicators / competencies	3	4	3 (4 times)	PDF (v4)
Move competency under a different cluster	3	4	1 (2 times) 1 (1 time) 1 (1 time) not taken into account	PDF (v2) PDF (v4)
Addition of behavioural indicators to existing competencies	11	15	7 (11 times) 4 (4 times) not taken into account	PDF (v2)
Addition of new competency to cluster	5	7	2 (4 times) 3 (3 times) not taken into account	PDF (v4)
Delete behavioural indicator/ competency	2 of which 1 behavioural indicators and 1 competency	2	1 (1 time) 1 (1 time) not taken into account	PDF(v2)
Total	37	48	13 (18 times) 12 (16 times) 12 (14 times) not taken in to account	PDF(v2) PDF(v4)

4.4.2.4 Refinement of the pharmaceutical abilities cluster

Changes were recommended to both competencies within the "pharmaceutical abilities" cluster with 11 changes to seven behavioural indicators. In total 37 changes were recommended, the majority of which related to the addition of behavioural indicators to existing competencies (Table 4.9).

The research team aimed to ensure a balance in the level of detail provided in the behavioural indicators. When reviewed by the research team, some of the behavioural indicators in this cluster were considered to be too detailed for a PDF. Therefore, they were removed. As three of the recommendations for changes in terminology referred to these behavioural indicators, the recommendations were not taken into account (Table 4.9). The other two recommended changes of terminology were considered to add too much detail to the behavioural indicators, hence it was decided not to take them into account. Similarly, the recommendations for adding new behavioural indicators were considered to be at too high a level for the MPharm degree. Such recommendations were not taken into account. The addition of three competencies was suggested; two were not taken into account as one was encompassed in existing competencies after other suggested changes were taken into account and the other was considered not to be attainable at the undergraduate level.

Table 4.9 Recommended changes to the PDF (v1) for the "pharmaceutical abilities" cluster

Description of change	Number of changes recommended	Number of times the changes were recommend	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	11	12	5 (6 times) 1 (1 time) 5 (5 times) not taken into account	PDF (v2) PDF (v4)
Merge behavioural indicators/ competencies	2	2	2 (2 times)	PDF (v2)
Addition of behavioural indicators to existing competencies	20	32	13 (19 times) 1 (1time) 1 (3 times) 5 (9 times) not taken into account	PDF (v2) PDF (v3) PDF (v4)
Addition of new competency to cluster	3	4	1 (1 time) 2 (3 times) not taken into account	PDF (v2)
Review order of clusters in the framework	1	1	1 (1 time)	PDF (v3)
Total	37	51	21 (28 times) 2 (2 times) 2 (4 times) 12 (17 times) not taken into account	PDF(v2) PDF(v3) PDF(v4)

Whilst some of the participants in FG3 suggested that some behavioural indicators within this cluster were more important than others and that the behavioural indicators should be differentiated according to this, the majority did not agree with the suggestion. It was thought that the importance of the behavioural indicators depends on the students' future interests and that the aim of the pharmacy degree should be to prepare graduates with general baseline knowledge, skills and abilities in order for them to be able to work in any sector of pharmacy. Moreover, it was not the aim of this project to establish which aspects of the MPharm degree were more important than others. Whilst it is important to ensure that graduates are fit for purpose, participants at this focus group perceived that maybe there are too many expectations from the undergraduate level, and perhaps some of these competencies should be expected at a different level. A summary of the clusters, competencies and number of behavioural indicators encompassed in PDF(v1) and PDF(v2) is shown in Table 4.10.

Table 4.10 Summary of the cluster, competencies and behavioural indicators in PDF(v1) and PDF(v2)

Competency	PDF v1		PDF v2	
	Clusters	Number of BIs	Clusters	Number of BIs
Communication	Interpersonal	9	Interpersonal	11
Team work		4		5
Diplomatic		1		
Respectful		3	Interpersonal	4
Ethical behaviour		8		8
Problem solving		5		10
Time management	Management (planning) and organisation/ self-management	4	Management (planning) and organisation/ self-management	4
Planning		3		5
Responsibility and accountability		5		4
Information processing and understanding	Study abilities	5	Study abilities	5
Self-directed in undertaking tasks		1		
Independent and self-directed learning		4	Study abilities	3
Produce quality work		1		
Reflective practice (self-assessment)		7	Study abilities	8

Information processing and understanding		4		4
Computer (IT)		3		2
Performing pharmaceutical calculations		5	Pharmaceutical abilities	6
Pharmaceutical knowledge abilities	Pharmaceutical abilities	9		
Pharmaceutical specific abilities		12		
Pharmacy practice abilities			Pharmaceutical abilities	22
Pharmaceutics				10
Pharmacokinetics				2
Pharmacology				5
Medicinal chemistry				4
Anatomy, physiology, and pathophysiology				1
Biology (Biochemistry and molecular and cellular biology)				6
Total	4 cluster 19 competencies	93	4 clusters 21 competencies	129

PDF (v2), resulting from this stage consisted of 129 behavioural indicators and 21 competencies organised into four clusters (Appendix 14). Next stage will describe the development of PDF (v3).

4.5 Development of PDF (v3)

The resultant PDF (v2) (section 4.4) was then used to form the basis of a workshop with MPharm students (WK3) and a series of interviews with experts in pharmacy (I1-I5) to develop PDF (v3) (Figure 4.1). Data from the student workshop (WK3) and from five of the interviews with experts in pharmacy and pharmacy education (Table 4.11) were used to review PDF (v2) and to develop PDF (v3). The latter was used as basis of discussion for the rest of three interviews with experts (section 4.6.1) (Table 4.11) and for two focus groups with pharmacy and other academics (FG4 and FG5) (sections 4.6.2 and 4.6.3) to develop PDF (v4).

4.5.1 Workshop with pharmacy students at the British Pharmaceutical Students' Association Annual Conference

A workshop (WK3) was conducted at the British Pharmaceutical Students' Associate (BPSA) Annual Conference in 2009 to pilot the PDF by discussing its content and the students' understanding of the behavioural indicators encompassed in PDF (v2) (Figure 4.1). Purposive sampling was used to access MPharm students from different universities across the UK. Approximately 120 students from all four years of the MPharm degree attended the conference, of whom the researcher expected about 60 self-selected students to attend the workshop. The workshop abstract, a form of information sheet, was presented in the conference booklet. Additionally, participants were asked for their informed consent to participate at the beginning of the workshop.

As a large number of participants were expected to attend this workshop (WK3) a structured schedule was developed by the researcher to facilitate participants' discussions in small groups. The schedule was reviewed for its face and content validity by two other researchers who agreed with the topics encompassed in it. The workshop aimed to explore students' views related to the following topics:

- the relevance of competencies within each cluster for the MPharm degree;
- their understanding of the phrasing of the behavioural indicators, suggestions for changes if thought necessary;

- their views about any competencies they thought were missing, if any;
- their suggestions for the way of phrasing them.

Additionally, a data collection form was developed by the researcher and reviewed by two other researchers for its face and content validity. The form explored individual participants' views about the use of the PDF and encompassed questions related to (Appendix 15):

- potential usefulness of the PDF for students;
- perceptions of motivations to engage with the PDF if it was an extra-curricular activity;
- potential reasons for not engaging with using it.

At the beginning of the workshop its content was described. Students were asked if they agreed to take part and for the collected data from WK3 to be used for research purposes. The researcher, who facilitated WK3, gave instructions to participants who were divided into seven groups of 10 students. Three groups received the following clusters: interpersonal, management and organisation and the study abilities cluster of the PDF (v2) to work on. The fourth cluster within the PDF(v2), pharmacy abilities, was split into two because in the previous focus groups there had been a lot of debate on the content of this cluster but also for the groups to have a similar quantity of work to do in the allocated time, as this cluster was larger than the others. Two groups received half of the cluster whilst two others received the other half. Each group was asked to record their collective responses to the issues being discussed on a sheet of paper. All notes were collected at the end of WK3 to ensure that all data were taken into account in the analysis. At the end of the WK3 participants were also asked to complete, if they so wished, a form which explored their individual views about the usefulness of the PDF. All data were collected by the researcher before students left WK3.

4.5.2 Individual interviews with national experts in pharmacy and pharmacy education

Experts in pharmacy education, and representatives of relevant national pharmacy and healthcare organisations were recruited to participate in individual interviews (I1-I8). Participants were identified through national pharmaceutical bodies and collaborators in participating schools of pharmacy. In total, 20 representatives of different sectors of the pharmacy profession were approached via email and one pre-registration tutor was contacted in person (Table 4.11). A recruitment letter (Appendix 16) together with an information sheet (Appendix 17) and a consent form (Appendix 11) were emailed to these experts. A larger number of community pharmacy stakeholders were approached to allow representatives of different community pharmacy organisations to express their views on the PDF.

Table 4.11 Branches of the profession from which experts in pharmacy and pharmacy education were recruited

Branch of profession	Number of representatives contacted	Number of representatives who participated in interviews	PDF version used for interviews
Community pharmacy	7	2	PDF (v2)
Industrial pharmacists' group	2	1	PDF (v2)
Independent pharmacy education consultant	1	1	PDF (v2)
Pre-registration tutor	1	1	PDF (v2)
NHS pharmacy education and development	3	1	PDF (v3)
UKCPA	3	1	PDF (v3)
RPSGB	2	1	PDF (v3)
NPA	1	-	-

As the interviewees were based in various locations across the UK, all interviews were conducted by the researcher over the telephone. A semi-structured interview guide was developed for the interviews (Appendix 18). The guide was reviewed for its face and content validity by two other researchers. Participants could discuss issues important to them within the context of competence and competency frameworks. The researcher could rephrase questions during the interviews and could add others in an iterative fashion, if deemed necessary. However, no changes were made to the interview guide between interviews. The use of an interview guide ensured that every respondent had an equal opportunity to express their

perceptions about competence. The topics in the first part of the interview related to respondents' views about the desired level of competence of pharmacy students, the development of a PDF for pharmacy students, the effective use of such a framework but also their views about the influence a framework might have on students' performance. In the second part of the interview, topics related to respondents' views on the clusters, competencies and behavioural indicators within the PDF.

The topic guide and PDF (v2) were subsequently emailed in advance to all those who agreed to participate, to allow participants time to familiarise themselves with it before the interview. The interviews were audio recorded with the consent of the participants. The interviews were transcribed before the analysis.

4.5.3 Results and discussion

Overall, 70 students attended WK3 organised to review PDF (v2) and develop PDF (v3) at the BPSA Annual Conference in 2009. Eight of the 20 representatives of the different sectors of the pharmacy profession contacted consented to participate in an interview. At this stage five telephone interviews were conducted with stakeholders in pharmacy and pharmacy education. They were representatives of community pharmacy, industrial pharmacy, a pre-registration tutor and a consultant pharmacist (Table 4.11). These stakeholders were interviewed at this stage as it was possible to agree an interview appointment. Three interviews were conducted in the next stage of the development of PDF (v4) (section 4.6.1). It was considered that if the PDF (v2) was reviewed and an updated version presented to the rest of the interviewees the content and face validity of the PDF would further be enhanced.

The five interviewees and the student participants at WK3 recommended that:

1. Fifty-four of the 130 behavioural indicators reviewed required no change;
2. Thirteen behavioural indicators should be removed;
3. Eight statements represented two or more behavioural indicators per statement and could be split to clarify the meaning of the statements;
4. Thirty nine behavioural indicators should be added.

Changes recommended and taken or not into account in the four clusters of the PDF will be described and discussed in turn in the context of the four clusters.

4.5.3.1 Refinement of the interpersonal cluster

The interpersonal cluster consisted of five competencies and 38 behavioural indicators. Participants who reviewed PDF (v2) recommended 50 changes in this cluster; some of the behavioural indicators required more than one change (Table 4.12). Some of the changes were taken into account in the development of PDF (v3) and others in the development of PDF (v4).

Due to the changes done to other behavioural indicators, one of the changes in terminology recommended was not taken into account. This was because after the changes to other behavioural indicators, this behavioural indicator would have overlapped with others. The rest of the four recommended changes in terminology were not taken into account as they would have been difficult for MPharm students to understand or would make behavioural indicators too complex.

One of the behavioural indicators recommended for addition was mentioned once by the students. As it was not supported by others, it was not included in the PDF. Students suggested that three behavioural indicators should be moved under different competencies. It was considered that the behavioural indicators should be encompassed in the existing competencies, therefore, the suggestions were not taken into account. One of the behavioural indicators recommended for deletion was considered important for the undergraduate degree and therefore, it was retained. This recommendation was mentioned only once by students, and not supported by stakeholders. Due to the changes made in the wording of other behavioural indicators, it was decided to delete two other behavioural indicators, for which no changes had been recommended, as it was considered that they now overlapped with others.

Table 4.12 Recommended changes to the PDF (v2) for the interpersonal cluster

Description of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change terminology in behavioural indicator for clarification	13	14	9 (9 times) 5 (5 times) not taken into account	PDF(v3)
Merge behavioural indicators/ Competencies/ clusters	7	9	3 (3 times) 4 (6 times) not taken into account	PDF(v4)
Split behavioural indicator for clarification	1	1	1 (1 time)	PDF(v3)
Add behavioural indicators to existing competency	22	23	14 (14 times) 7 (8 times) 1 (1 time) not taken into account	PDF(v3) PDF(v4)
Review order of the clusters in the framework	1	1	1 (1 time)	PDF(v3)
Review order of behavioural indicators in the framework	1	1	1 (1 time)	PDF(v4)
Move behavioural indicator to a different competency	3	4	3 (4 times) not taken into account	-
Delete behavioural indicator	2	2	1 (1 time) 1 (1 time) not taken into account	PDF (v3)
Total	50	55	26 (26 times) 11 (12 times) 14(17 times) not taken into account	PDF(v3) PDF(v4)

4.5.3.2 Refinement of the management and organisation cluster

The management and organisation cluster of PDF (v2) encompassed three competencies, one of which required one change. Four changes were recommended to four of the 13 behavioural indicators. Two of the 13 behavioural indicators were recommended for deletion (Table 4.13). However, this was not done as it was thought that they were relevant to the MPharm degree. Participants also suggested that one behavioural indicator, related to professionalism, should be added to the PDF (v3). However, PDF (v2) did encompass at this stage a behavioural

indicator that related to professionalism. In PDF (v4) this issue was reconsidered and the behavioural indicators in this competency were expanded. It was also suggested that behavioural indicators within this cluster were complex and too detailed whilst behavioural indicators in other clusters were more generic. Furthermore, it was thought that the management and organisation cluster should be merged with the interpersonal and study abilities clusters as behavioural indicators within these clusters were overlapping. This issue was addressed in the development of PDF (v4) (section 4.6) .

Table 4.13 Recommended changes to the PDF (v2) for the management (planning) and organisation cluster

Description of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	2	3	2 (3 times)	PDF(v3)
Change of competency title for clarification	1	1	1 (1 time)	PDF(v3)
Merge behavioural indicators/competencies/ clusters	1	1	1 (1 time)	PDF(v4)
Addition of behavioural indicators to existing competency	3	3	2 (2 times) 1 (1 time) not taken into account	PDF(v3)
Delete behavioural indicator	2	2	Not taken into account	-
Total	9	10	5 (6 times) 1 (1 time) 1 (1 time) not taken into account	PDF(v3) PDF(v4)

4.5.3.3 Refinement of the study abilities cluster

Two of the five competencies in the study abilities cluster had three changes recommended and students in WK3 suggested that the name of two of the competencies should be changed. Seven behavioural indicators out of 22 required 10 changes. The total number of changes recommended for this cluster was 14 (Table 4.14).

It was decided that one behavioural indicator for which students suggested clarifications, was indeed clear, thus the suggestion was not taken into account. After changes to other behavioural indicators, it was thought that the behavioural indicator for which clarifications were suggested now overlapped with others, thus, it was deleted.

Table 4.14 Recommended changes to the PDF (v2) for the study abilities cluster

Description of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	5	5	3 (3 times) 2 (2 times) not taken into account	PDF(v3)
Change of competency title for clarification	2	2	2 (2 times)	PDF(v3)
Merge behavioural indicators/competencies/ clusters	1	1	1 (1 time)	PDF(v4)
Add behavioural indicators to existing competency	1	1	1 (1 time)	PDF(v3)
Delete behavioural indicator	5	5	2 (2 times) 3 (3 times) not taken into account	PDF (v3)
Total	14	14	8 (8 times) 1 (1 time) 5 (6 times) not taken into account	PDF(v3) PDF(v4)

4.5.3.4 Refinement of the pharmaceutical abilities cluster

The pharmaceutical abilities cluster encompassed eight competencies and 56 behavioural indicators. The participants suggested a total of 52 changes (Table 4.15). In addition to the suggested deletions of four behavioural indicators, it was decided to delete another seven as they overlapped with others after the changes. Moreover, while one behavioural indicator had been recommended to be merged with another, it was also decided to merge a third behavioural indicator with a fourth, in order to refine the PDF.

Four of the behavioural indicators for which recommendations for changes in terminology had been made and one which was recommended to be split in two were deleted as they overlapped with others after other changes. Three of the recommendations for changes in terminology were considered not to clarify the meaning of the respective behavioural indicator. Therefore, changes were not taken into account. It was also considered that four of the behavioural indicators that were suggested for addition would have added too much detail to the PDF, therefore, they were not taken into account. One competency that was recommended to be deleted was considered important for the undergraduate level and was still included in PDF (v3). One behavioural indicator that had been recommended to be moved to a different competency was left under the original competency in PDF (v3), and moved elsewhere in PDF (v4).

Table 4.15 Recommended changes to the PDF (v2) for the pharmacy abilities cluster

Description of the type of change	Number of changes recommended	Number of times change was recommended	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	22	25	12 (14 times) 3 (3 times) 7 (8 times) not taken into account	PDF(v3) PDF(v4)
Merge behavioural indicators/ competencies/ clusters	1	1	1 (1 time)	PDF(v3)
Split behavioural indicator for clarification	10	14	4 (10 times) 3 (4 times) not taken into account	PDF(v4)
Move behavioural indicator to a different competency	1	1	1 (1 time)	PDF(v3)
Move competency to a different cluster	1	1	Not taken into account	-
Add behavioural indicators to existing competency	13	15	5 (5 times) 4 (5 times) 4 (5 times) not taken into account	PDF(v3) PDF(v4)
Delete behavioural indicator	4	6	3 (3 times) 1 (3 times) not taken into account	PDF (v3)
Total	52	63	22 (24 times) 11 (18 times) 15 (20 times) not taken into account	PDF(v3) PDF(v4)

In addition to the above suggestions students at WK3 and the stakeholder interviewees made some other general suggestions related to the pharmacy abilities cluster (Table 4.16). These suggestions supported the development of both the PDF (v3) and PDF (v4). Some of the changes recommended were complex, and it was considered that they needed to be further investigated in FG4 and the three remaining interviews with stakeholders, thus, these recommendations were acted upon in the development of PDF (v4).

Table 4.16 General recommendations made to the pharmacy abilities cluster

Other recommendations	Number of times suggested	Retailed suggestion
Wording of the behavioural indicators	23	▪ Some competencies are too general whilst others are to specific ▪ Different areas are covered in different amount of detail ▪ The science should be related to its use in practice ▪ Word the behavioural indicators at the "have to know" level rather than "should or could know" ▪ Behavioural indicators are high level, practice based ▪ Word behavioural indicators in third person ▪ Avoid asking several questions in one behavioural indicator ▪ Use consistent language ▪ Use simple wording ▪ Avoid compartmentalised learning ▪ Avoid making the framework a "tick box" exercise

Both participants at WK3 and the five interviewees thought that the wording of the behavioural indicators should be reviewed to ensure an appropriate level for the undergraduate degree, but also to ensure the same amount of detail is used across the PDF. Participants at WK3 suggested that the behavioural indicators should be phrased in third person singular, to make them more personal to students. This was opposite to what had been suggested before by the research team. After reviewing other developed frameworks it was decided to phrase the behavioural indicators using the indicative, for example the ability to communicate with patients (Mills *et al.*, 2004; Antoniou *et al.*, 2005).

Recommendations mentioned in Table 4.16 relating to the wording of the behavioural indicators were addressed by reviewing the behavioural indicators and acting upon those that could be completed at this stage. As the changes were made, it was ensured that there was consistency in the terms used. The wording of the behavioural indicators was clarified where needed. It was also suggested that the structure of the PDF and the behavioural indicators encouraged thinking and learning in "boxes", that is, each subject area on its own, rather than encouraging MPharm students to make links between the subject areas and apply their learning in different situations. Due to the limited time that the researcher had for revising the PDF (v2) in order to develop the PDF (v3) and take it to FG4 (4.6.2), the latter recommendation was addressed in the development of PDF (v4).

In order to address the concern one of the interviewees had raised about the PDF considered as a "tick box" exercise it was decided that the PDF should indicate that the development of competencies, as suggested by stakeholders, is a staged process. The stakeholders thought that a way to do this was to encompass Miller's pyramid (Miller, 1990) in the PDF. A rating scale for the self-assessment was suggested by the research team for the next stage. A description of the rating scale was attached to the PDF (v4) in section 4.6.5.5, which was also the version used for the evaluation of the use of the PDF (chapter 5).

Additionally, participants at WK3 and the interviewees made other general recommendations for the refinement of PDF (v2). One of the recommendations, suggested by one of the stakeholders, referred to the inclusion of commercial elements in the PDF. It was considered that these are not appropriate at the undergraduate level, thus they were not encompassed in the framework. As suggested by participants at WK3 and the interviewees, the order of competencies and behavioural indicators was reviewed and the issue was readdressed in the development of the PDF (v4) (section4.6). A summary of the clusters, competencies and number of the behavioural indicators encompassed in the three versions of the PDF is shown in Table 4.17.

Table 4.17 Summary of the clusters, competencies and behavioural indicators encompassed in the PDF (v1), PDF (v2) and PDF (v3)

Competencies	PDF version 1		PDF version 2		PDF version 3	
	Clusters	Number of BIs	Clusters	Number of BIs	Clusters	Number of BIs
Communication	Interpersonal	9	Interpersonal	11	Interpersonal	8
Team work		4		5		5
Diplomacy		1				
Respectful		3	Interpersonal	4	Interpersonal	4
Ethical behaviour		8		8		8
Problem solving		5		10	Personal management and problem solving	11
Time management	Management (planning) and organisation/	4	Management (planning) and organisation/	4		4
Planning		3		5		9

Responsibility and accountability	self-management	5	self-management	4		5
Information processing and understanding	Study abilities	5	Study abilities	5	Study abilities	11
Self-directed in undertaking tasks		1				
Independent and self-directed learning		4	Study abilities	3		
Produce quality work		1				
Reflective practice (self-assessment)		7	Study abilities	8	Study abilities	5
Information processing and understanding		4		4		
Computer (IT)		3		2	Study abilities	2
Performing pharmaceutical calculations		5	Pharmaceutical abilities	6	Pharmaceutical abilities	6
Pharmaceutical knowledge abilities	Pharmaceutical abilities	9				
Pharmaceutical specific abilities		12				
Pharmacy practice abilities			Pharmaceutical abilities	22	Pharmaceutical abilities	17
Pharmaceutics				10		11
Pharmacokinetics				2		
Pharmacology				5	Pharmaceutical abilities	4
Medicinal chemistry				4		3
Anatomy, physiology, and pathophysiology				1		1
Biology (Biochemistry and molecular and cellular biology)				6		4
Total	4 cluster 19 competencies	93	4 clusters 21 competencies	129	4 clusters 8 competencies	118

The resultant PDF (v3) consisted of 118 behavioural indicators and 8 competencies organised in four clusters (Appendix 19). Due to the concerns about the length of the PDF (v2) the research team aimed to reduce the number of competencies and

behavioural indicators to ensure the students would engage with it. Indeed, Table 4.17 shows that both the number of competencies and of behavioural indicators was reduced from PDF (v2) to PDF (v3). The next section will describe the development of PDF (v4).

4.6 Development of PDF (v4)

The resultant PDF (v3) (section 4.5) was used to form the basis of FG4 with academics and FG5 with experts in education and the three remaining one-to-one interviews with stakeholders in pharmacy and pharmacy education (Figure 4.1).

4.6.1 Interviews with national experts in pharmacy and pharmacy education

Three of the eight recruited stakeholders in pharmacy and pharmacy education who had agreed to participate in telephone interviews were interviewed at this stage. Further information on the recruitment is provided in section 4.5.2. Whilst the new PDF (v3) was used as the basis for the discussions, the previously developed interview guide was followed (section 4.5.2; Appendix 18).

4.6.2 Focus group with academics at University B

At University B purposive sampling was used to recruit academics who were members of a group involved in the development of pharmacy teaching. They were approached with the support of the chair of the group and emailed: a recruitment letter, (Appendix 9), an information sheet (Appendix 10) and a consent form (Appendix 11). These members included lecturers, teacher practitioners and principal pharmacists from large teaching hospitals. Those who agreed to participate were emailed PDF (v3) (Appendix 19), to offer participants the chance to familiarise themselves with the PDF in advance and to ensure that time during the focus group was used efficiently.

A topic guide was developed by the researcher for this focus group (Appendix 20) to facilitate participants in sharing their views about the clusters, competencies and behavioural indicators encompassed in the PDF. The topic guide was reviewed for its face and content validity by another researcher, who agreed with the topics encompassed in the topic guide. The focus group was facilitated by the researcher.

The emphasis of this focus group's discussion was on the "pharmacy abilities" cluster, as the previous participants had expressed differing views concerning its competencies. Participants were asked to suggest any changes they thought necessary. Participants who attended FG4 were asked at the beginning to give informed consent for their participation and recording the focus group.

4.6.3 Focus group with experts in education

Purposive sampling was used to recruit a group of experts in matters concerning higher education to explore the views of non-pharmacists on the terminology and formatting used in PDF (v3) from an educational perspective (FG5).The 21 representatives of the group were emailed a recruitment letter (Appendix 9), an information sheet (Appendix 10) and a consent form (Appendix 11). Those who agreed to participate were emailed the PDF (v3), to allow participants time to become familiar with the materials and ensure the time during the focus group was used efficiently.

A topic guide was developed by the researcher for this focus group (Appendix 21). The topic guide was reviewed for its face and content validity by another member of the research team, who agreed with the topics encompassed in the topic guide. The topics related to participants' perceptions about how to make the PDF more student friendly and how to encourage students to engage with it. Participants were also asked about the type of a rating scale they thought would be appropriate in the PDF. No examples of rating scales were given to the participants in order not to influence participants' views. However, the researcher considered that a Likert scale would be the most appropriate to be used as such a scale had been used in similar frameworks developed before (Mills *et al.*, 2004; Antoniou *et al.*, 2005). FG5 was facilitated by the researcher.

4.6.4 Data handling and analysis

Audio-recorded data from focus groups and interviews was transcribed verbatim before the analysis. The notes written by the participants in workshops and focus groups and those written by the researcher were added to the transcribed data. Data from workshops, focus groups and interviews was analysed using content analysis (Krippendorff, 1980) to support the development of the PDF. Additionally framework analysis (Ritchie and Lewis, 2003) was used to analyse the data from the interviews which related to stakeholders' views about the PDF. A detailed description of the process is provided in section 3.4. All collected data is stored in locked cabinets and will be kept for five years at the University of Bath in accordance with the Data Protection Act 1998.

4.6.5 Results

At this stage three telephone interviews were conducted with stakeholders in pharmacy and pharmacy education. These stakeholders in pharmacy and pharmacy education were representatives of the RPSGB, UKCPA and NHS Pharmacy education and development (Table 4.11). Seven of the nine members of the pharmacy group at University B participated in FG4. Furthermore, seven of the 21 members of the group of experts in education participated in FG5.

This section presents the recommendations for changes made by participants in FG4 and FG5 and the interviewees for each individual cluster and a detailed description of the general recommendations for changes which did not refer to particular clusters but to the overall PDF. Interviewees and participants in the focus groups recommended that:

1. Ninety seven of the 118 behavioural indicators required no change;
2. Three behavioural indicators should be removed;
3. Nineteen behavioural indicators should be added;
4. Twenty one behavioural indicators needed one or more changes;
5. Six out of the eight competencies required one or more changes; and
6. All of the clusters required changes and re-structuring.

Compared to the previous version of the PDF, less changes were required, indicating that the iterative stages in the development of the PDF ensured its content validity. The recommendations for changes in each individual cluster are discussed in turn. Some of the changes recommended were not taken into account (Table 4.18 to Table 4.21) as after other changes, completed behavioural indicators to the PDF would have overlapped with those recommended.

4.6.5.1 Refinement of the interpersonal cluster

Changes were recommended for three of the four competencies (Table 4.18) and one of the 25 behavioural indicators required changes. All participants who reviewed PDF (v3) recommended that the cluster should be merged with the personal management cluster. The behavioural indicators in the two clusters overlapped and this issue was addressed in developing PDF (v4).

Table 4.18 Recommended changes to PDF (v3) for the interpersonal cluster

Description of the type of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account (number of times the changes were recommended)	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	1	1	1 (1 time)	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	2	2 cluster	2 (2 times)	PDF (v4)
Move competency to a different cluster	1	2	- 2 (2 times) not taken into account	–
Addition of behavioural indicators to existing competency	7	7	4 (4 times) 3 (3 times) not taken into account	PDF (v4)
Review order of behavioural indicators to competency	1	1	1 (1 time)	PDF (v4)
Total	12	14	7 (8 times) 5 (5 times) not taken into account	PDF (v4)

4.6.5.2 Refinement of the personal management cluster

All four competencies in the personal management cluster required changes. Out of the 29 behavioural indicators, five required changes. The total number of changes recommended for this cluster was 16 (Table 4.19).

Table 4.19 Recommended changes to PDF (v3) for the personal management cluster

Description of the type of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	5	5	5 (5 times)	PDF (v4)
Move behavioural indicator to a different competency	1	1	- 1 (1 time) not taken into account	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	3	3 2 clusters 1 competency	3 (3 times)	PDF(v4)
Move competency to a different cluster	3	5	- 3 (5 times) not taken into account	PDF (v4)
Add behavioural indicators to existing competency	2	2	2 (2 times)	PDF (v4)
Condense cluster	1	2	1 (2 times)	PDF (v4)
Condense competency	1	2	1 (2 times)	PDF (v4)
Total	16	20	16 (14 times) 6 (6 times) not taken into account	PDF (v4)

4.6.5.3 Refinement of the study abilities cluster

The study abilities cluster contained three competencies, of which two required seven changes and 18 behavioural indicators of which five required a total of eight changes. In total 18 changes were recommended (Table 4.20). The two recommendations for changes of terminology in the behavioural indicators were

not taken into account as the respective behavioural indicators were deleted. This was done as they would have overlapped with others after other changes.

Table 4.20 Recommended changes to PDF (v3) for the study abilities cluster

Description of the type of change	Number of changes recommended	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	2	3	- 2 (3 times) deleted	PDF (v4)
Move behavioural indicator to a different competency	4	4	2 (2 times) 2 (2 times) not taken into account	PDF (v4)
Change of competency title for clarification	2	3	1 (2 times) 1 (1 time) not taken into account	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	4	4 2competencies 2 behavioural indicators	4 (4 times)	PDF (v4)
Move competency to a different cluster	3	5	3 (3 times) 2 (2 times) not taken into account	PDF (v4)
Add behavioural indicators to existing competency	3	3	2 (2 times) 1 (1 time) not taken into account	PDF (v4)
Total	18	22	12 (13 times) 6 (6 times) not taken into account 3 (3 times) deleted	PDF (v4)

4.6.5.4 Refinement of the pharmacy abilities cluster

The pharmacy abilities cluster consisted of seven competencies and 46 behavioural indicators. Participants in FG4 and FG5 and interviews recommended a total of 34 changes that related to particular competencies and behavioural indicators within the cluster (Table 4.21).

Table 4.21 Recommended changes to the PDF (v3) for the pharmaceutical abilities cluster

Description of the type of change	Number of changes	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change terminology in behavioural indicator for clarification	9	10	8 (8 times) 2 (2 times) not taken into account	PDF (v4)
Move behavioural indicator to a different competency	1	1	1 (1 time)	PDF (v4)
Change competency title for clarification	10	14	10 (14 times)	PDF (v4)
Split behavioural indicator for clarification	3	3	1 (1 time) 2 (2 times) not taken into account	PDF (v4)
Add behavioural indicators to existing competency	7	7	6 (6 times) 1 (1 time) not taken into account	PDF (v4)
Add new competency to cluster	1	1	1 (1 time)	PDF (v4)
Delete behavioural indicator	3	3	1 (1 time) 2 (2 times) not taken into account	PDF (v4)
Total	34	39	28 (32 times) 7 (7 times) not taken into account	PDF (v4)

Participants in the focus groups and the interviews also recommended general changes related to the competencies and behavioural indicators encompassed in this cluster and to its overall structure (Table 4.22 and Table 4.23). Recommendations were grouped into two main themes: wording of the behavioural indicators and structure of the cluster. A detailed description of the recommended changes is shown in tables below in the "retailed suggestion" column.

Table 4.22 Recommended changes related to the wording of the behavioural indicators in the pharmacy abilities cluster.

Theme	Number of times suggested	Retailed suggestion
Wording of behavioural indicators	31	▪ High level behavioural indicators; encourage disengagement with the framework; thinking of Miller's pyramid currently the behavioural indicators are at the "does" level ▪ "Knows how" or "shows how" level are more achievable at the undergraduate level ▪ Currently behavioural indicators are science based, which is assessed in exams ▪ Global/complex behavioural indicators ▪ Some behavioural indicators are too specific others are simple and descriptive ▪ Task driven ▪ Behavioural indicators are discrete; high level behavioural indicators expected of someone working in practice not encompassed ▪ Behavioural indicators should be clear, should use simple words and should be concise ▪ Relate behavioural indicators to pharmacists' related activities to patient's journey ▪ Link scientific competencies with behaviour ▪ Aim of the behavioural indicators should be the assessment of students' skills ▪ Ability to deal with patients is underpinned by science ▪ Split the behavioural indicators which encompass two verbs ▪ Relate the competencies and behavioural indicators to patients ▪ For undergraduates to achieve the behavioural indicators encompassed in the framework a step by step approach is needed

There was a general agreement between participants in FG4 and two of the interviewees that behavioural indicators in the pharmacy abilities cluster did not involve the same amount of detail in their description. They also perceived that behavioural indicators were at too high a level for the undergraduate degree. In contrast, the representative of the RPSGB suggested that behavioural indicators were task driven, and that they should be phrased at a higher level, as students are expected to become practitioners. The research team decided that a balance should be reached in all the behavioural indicators and that in this cluster they should indicate to students the link between science and patient care, and how the science supports the practice. Thus, following recommendations in Table 4.22 behavioural indicators were reviewed in order to regroup, reorder and rephrase them. Furthermore there was also general agreement that the competencies and some of the behavioural indicators in the pharmacy abilities cluster were too knowledge based, and that they should be focused more on patient care. However, participants had different views on the changes that should be made. Both recommendations

related to the wording of the behavioural indicators and the structure of the cluster were addressed by the research team in the development of PDF (v4).

Table 4.23 General recommendations related to the structure of the pharmacy abilities cluster

Theme	Number of times suggested	Retailed suggestion
Structure of cluster	6	▪ Split into more sections ▪ Split into areas related to: drugs, patients, dispensing, health improvement wellness and disease prevention ▪ Order of the competencies : generic scientific, chemistry and pharmacognosy, pharmaceutics, pharmacology, and anatomy all underpinning the patient's journey ▪ Apply to science key tasks ▪ Apply the science key tasks that can be measured

4.6.5.5 General recommendations for the development of the PDF (v4)

Furthermore, participants at FG 4 and 5 and the last three interviews suggested several general changes for the refinement of the PDF (v3) which have been grouped into themes, which will be further discussed.

Similarly to participants at FG4, the need to clarify the aim of the PDF was identified by the research team. It was decided that it was important to clarify that the PDF was designed as a tool to support the learning of MPharm students. Participants at FG4 raised the issue of consistency of staff assessing students if the PDF was used as a formative assessment tool. It was thought that staff consistency in assessing students should be carefully addressed if the PDF became part of the course, and would need to be further explored.

Table 4.24 General recommendations related to the aim of the PDF

Theme	Number of times suggested	Retailed suggestion
Clarification of the aim of the PDF	3	▪ Suggested aim: to measure if students can do certain things ▪ Possible aims: assessment tool of competency or performance or feedback tool ▪ Consistency in evaluation if it is an assessment tool

Other recommended changes related to the pre-registration performance-standards and their link with the PDF. Participants at FG4 and the interviewee who represented the UKCPA suggested that the pre-registration performance standards (Royal Pharmaceutical Society of Great Britain, 2008b) should be encompassed in the PDF in order to support students in understanding competencies, which they would have to address when starting the pre-registration year. As recommended, the researcher reviewed the behavioural indicators and encompassed pre-registration performance standards in the PDF (v4), and ensured the topics covered in these were also covered, at a different level, in the PDF.

Experts in education, who were not pharmacists, recommended that the PDF be regularly reviewed, as the development of competencies is an ongoing process. Participants in FG 4 and FG5 and the three interviewees recommended that the PDF (v3) should be restructured (Table 4.25). The recommendations included first a merger of three of the clusters (study abilities, personal management and interpersonal clusters) and then the development of two clusters, one related to pharmacy specific competencies, and another related to more professional general competencies. The research team decided to regroup the competencies into two clusters. The first cluster focused on pharmacy specific abilities to ensure safe and effective patient care and the other focused on personal attributes important to support the daily activities of future pharmacists. In order to support the regrouping of competencies and clusters from PDF (v3) to PDF (v4) the GLF was reviewed again and the recommendations and the plans were discussed with the other members of the research team especially to uncover any overlaps between the clusters, the competencies and the behavioural indicators. This was a very important step in the development of the PDF.

Participants at FG4 and FG5 recommended that behavioural indicators should be reordered and regrouped. Therefore, behavioural indicators were moved from their grouping in PDF (v3) and based on suggestions by participants at FG4 and FG5 placed under more appropriate competencies and clusters Table 4.25.

Table 4.25 General recommendations related to the structure of the PDF

Theme	Number of times suggested	Retailed suggestion
Restructure of the PDF	16	▪ Layout ▪ Merge the following clusters: study abilities, personal management and interpersonal ▪ Two main clusters: pharmacy and professional ▪ Regroup competencies into clusters ▪ Reorder and regroup behavioural indicators ▪ Factors influencing re-ordering and regrouping: - relation between clusters - relation between behavioural indicators - how the framework will be used ▪ Consider a structure similar to the ACLF: foundation, excellence, mastery level

One of the interviewees suggested that the ACLF does show that attaining competence is a staged process, by indicating the different levels of competence expected for the advanced level. The research team perceived that a structure similar to the ACLF (Table 4.25) would not be appropriate for the undergraduate level, as it would be too complex. As suggested in FG4, it was considered that it was important for the PDF to show that achievement of competence is a staged process, and it was thought the best way to do this was to use Miller's pyramid (Miller, 1990) in the instructions on how to use the PDF, as it was thought this was more appropriate for the undergraduate level.

Following the recommendation of participants at FG4, the ethical behaviour competence from PDF (v3) was expanded and the existing behavioural indicators rephrased so that professionalism would be encompassed in the descriptors of this competence. The title of the competency changed from ethical behaviour in PDF (v3) to ethics and professionalism in PDF (v4).

The research team decided to propose to participants at FG4 a four point Likert scale (Oppenheim, 1992) ranging from very good, good, average to poor and also to provide a not applicable option. Likert scales are the recommended scales to be used in the measurement of attitudes (Oppenheim, 1992). Likert scales have been reported in the literature to have been used to explore medical students' perceived level of acquisition of competency-based learning outcomes and transferable skills (Pales *et al.*, 2008; Whittle and Murdoch Eaton, 2001), pharmacy students' self-assessment of their competencies and generally to assess students' performance

(Monaghan *et al.*, 1995; Scott *et al.*, 2002; Pales *et al.*, 2008). However, the rating scale proposed received negative feedback from participants at FG4, who perceived that the proposed rating scale would only be applicable if behavioural indicators would require a yes or no answer and that the rating scale did not make sense as the behavioural indicators did not require a yes or no answer. Thus, it was decided to adopt a Likert scale ranging from always, mostly, sometimes and never which has also been used in validated competency frameworks for general level pharmacists (Antoniou *et al.*, 2005). However, MPharm students should be considered on the way to becoming competent healthcare professionals, therefore, the rating scale should indicate to students that the development of competencies is a staged and ongoing process. As recommended by participants at FG4 but also by the five of the interviewees, one of the ways to indicate this would be to encompass Miller's pyramid in the PDF (Miller, 1990) as part of the rating scale (Table 4.26).

Table 4.26 General recommendations related to the rating scale

Theme	Number of times suggested	Detailed suggestion
Rating scale	17	▪ Answer to current statements should be yes or no ▪ A very good/good/average/poor/not applicable rating scale would not be appropriate ▪ Recommended scale: always/usually/sometimes/never ▪ Problematic: an individual is either competent or not competent ▪ A rating scale does not show the different levels of competence across the degree ▪ Use Miller's pyramid as a rating scale know/know how/show/does ▪ Advantages of using Miller's pyramid as a rating scale: independent of year, independent of what students study and it adapts to the undergraduate level

A rating scale was developed (Appendix 22) to support students to self-assess their competence. The developed rating scale allowed students also to indicate that they did not study anything related to a behavioural indicator. This was done by including a "not applicable" answer option and its respective explanation. Thus, an explanation of the rating scale in the PDF was mapped onto the explanation of the rating scale used in the GLF. Additionally, the rating scale in the PDF was also mapped onto Miller's pyramid in order to adapt it for the undergraduate level.

In order to ensure that cluster names were clear and students would not misinterpret them, one of the interviewees recommended that they should consist of one word. This interviewee as well as the participants at FG4 suggested that some of the behavioural indicators were too simple whilst others were too

complex. Participants at FG 3 and FG4 commented on the same issue and attempts were made to solve the problem. Further clarifications were completed in the development of PDF (v4).

Participants at FG5 with experts in education suggested that not only students would need support in completing the PDF but the academics who guide them would need assistance as well. This issue was addressed in the evaluation phase. The need for guidance and support is also discussed in section 5.6.10.

In order to develop PDF (v4) the research team reviewed a "work in progress" PDF, which is referred to as PDF(v4A). The sections relating to communication, medicinal chemistry and pharmacology, in which the researcher felt another expert opinion was needed, were reviewed by experts in the appropriate fields at University A. Both the researcher and the expert in communication agreed that there was an overlap between the communication competency under the interpersonal competencies and the communication underpinning the delivery of good quality patient care. The changes recommended by experts in medicinal chemistry and pharmacology are included in Table 4.27.

The pharmacy competencies cluster in in the "work in progress" PDF contained eight competencies, of which five required changes according to the experts. Some of the competencies required more than one change. Thirty out of the 56 behavioural indicators required changes. One behavioural indicator required more than one change (Table 4.27). After changes to other behavioural indicators, it was thought that the behavioural indicator which was suggested to be moved to another competency now overlapped with others, thus, it was deleted. The research team decided not to take into account three of the suggestions related to the merger of behavioural indicators as they would have overlapped with others, after changes to other behavioural indicators were made.

Table 4.27 Recommended changes to PDF (v4A) for the pharmacy competencies cluster

Description of the type of change	Number of recommended changes	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	7	8	7 (8 times)	PDF (v4)
Move behavioural indicator to a different competency	1	2	1 (1 time) 1 (1 time) deleted	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	9 behavioural indicators	11 behavioural indicators	8 (8 times) 3 (3 times) not taken into account	PDF (v4)
Split one behavioural indicator for clarification	1	1	1 (1 time)	PDF (v4)
Move competency to a different cluster	1	2	1 (2 times)	PDF (v4)
Add behavioural indicators to existing competency	1	1	1 (1 time)	PDF (v4)
Condense competency	2	2	2 (2 times)	PDF (v4)
Delete behavioural indicator	9	9	7 (7 times) 2 (2 times) not taken into account	PDF (v4)
Total	31	36	27 (30 times) 6 (6 times) not taken into account	PDF (v4)

Three out of the five competencies in the study abilities cluster required three changes according to the experts. No behavioural indicator needed to be added to this cluster. Six behavioural indicators out of 14 required changes. One behavioural indicator required more than one change. In total 11 changes were recommended for this cluster (Table 4.28). After changes to other behavioural indicators, some of the changes recommended by the experts (Table 4.28) were not taken into account, as otherwise the behavioural indicators and competencies would have overlapped with others.

Table 4.28 Recommended changes to "work in progress" PDF for the study abilities cluster

Description of the type of change	Number of recommended changes	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	3	4	3 (3times) 1 (1 time) not taken into account	PDF (v4)
Move behavioural indicator under a different competency	1	1	1 (1 time) not taken into account	-
Change of competency title for clarification	1	1	1 (1 time)	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	4	4 3 competency 1 behavioural indicator	4 (4 times)	PDF (v4)
Delete behavioural indicator	2	2	2 (2 times)	PDF (v4)
Total	11	12	10 (10 times) 2 (2 times) not taken into account	PDF (v4)

The personal competencies cluster consisted of 12 competencies and 19 behavioural indicators, of which three required a total of three changes (Table 4.29). The behavioural indicator for which changes of terminology were recommended were not taken into account as the behavioural indicator was deleted as it would have overlapped with others after other changes were made.

Table 4.29 Recommended changes to "work in progress" PDF for the personal competencies cluster

Description of the type of change	Number of recommended changes	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	2	2	- 2 (2 times) deleted	-
Add behavioural indicator to existing competency	1	1	1 (1 time)	PDF (v4)
Total	3	3	1 (1 time) 2 (2 times)	PDF (v4)

The interpersonal cluster consisted of seven competencies, of which one required one change and 22 behavioural indicators, of which 19 required 20 changes. A total

number of 21 changes were recommended by the experts for this cluster (Table 4.30). The "work in progress" PDF undertook a lot of changes. Some of the changes recommended by the experts were not taken into account as behavioural indicators or competencies to which they referred would have overlapped with others after other changes were done.

Table 4.30 Recommended changes to "work in progress" PDF for the interpersonal competencies cluster

Description of the type of change	Number of recommended changes	Number of times the change was recommended	Number of changes taken into account	PDF in which changes were taken into account
Change of terminology in behavioural indicator for clarification	7	8	4 (5 times) 3 (3 times) not taken into account	PDF (v4)
Move behavioural indicator under a different competency	5	5	4 (4 times) 1 (1 time) not taken into account	PDF (v4)
Merge behavioural indicators/ competencies/ clusters	5	5 4 behavioural indicators 1 competency	5 (5 times)	PDF (v4)
Delete behavioural indicator	4	4	3 (3 times) 1(1 time) not taken into account	PDF (v4)
Total	21	22	16 (17 times) 5 (5 times)	PDF (v4)

Throughout the development of the different versions of the PDF a small number of competencies and behavioural indicators were recommended for deletion. This might indicate that participants in the focus groups, workshops and the interviewees considered that most of the competencies and behavioural indicators encompassed in the PDF were important for the MPharm degree. Other behavioural indicators were deleted during the development of PDF (v4) as they overlapped with or duplicated others after the changes had been made.

Encompassing all the above indicated changes the researcher restructured the whole PDF, changed, regrouped and reordered the competencies and the behavioural indicators within the PDF. This was a complex task which resulted in the final version of the PDF (v4) which was evaluated in the three schools of pharmacy involved in the research project (Table 4.31). The PDF (v4) consisted of two clusters: Professional and Delivery of patient care competencies. The "Professional

Competencies" cluster consisted of 11 competencies and 37 behavioural indicators and the "Delivery of Patient Care Competencies" cluster consisted of six competencies and 40 behavioural indicators.

Table 4.31 Professional development framework version 4

I. PROFESSIONAL COMPETENCIES
I.1. Time management
Are you able to… …plan your own study time? …set, work towards and meet deadlines, using an appropriate amount of time? …utilise (make practical use of) others' time wisely in meetings and group work? …arrive on time for any appointments or commitments (lectures / workshops/ placements/ meetings with tutors)?
I.2. Prioritisation
Are you able to… …prioritise tasks effectively?
I.3.Initiative
Are you able to… …initiate activities to complete the tasks/assignments after initial instruction?
I.4.Task completion
Are you able to… …complete tasks and assignments accurately and make sure they meet their respective objectives?
I.5.Accountability
Are you able to… …be counted on to fulfil the responsibilities you have taken or have been given to you, and meet the expectations?
I.6.Information technology
Are you able to… ….use word processing, spread sheets and presentation software? ….use specific software required for workshops and practical classes?
I.7.Team work
Are you able to… …demonstrate your ability to work with others to achieve a common goal? …be fair and tactful in all dealings with staff, peers, patients and other healthcare professionals? …resolve conflicts between peers?
I.8.Problem solving
Are you able to… …identify the problem(s) that require(s) solving, for example, in patient care? …gather information about the problem(s)? …evaluate information that has been gathered? …recognise your own limitations and seek appropriate assistance? …suggest and if appropriate, implement solutions to problems? …identify where a compromise in solving the problem(s) is/are necessary?
I.9. Critical appraisal relevant to patient care

Are you able to…
…use appropriate resources (library catalogue, databases, internet, journals, text books, other people) to gather information related to a task (patient disease state, essay, dissertation, project report)?
…employ effective and efficient literature search strategies using appropriate keywords?
…evaluate the relevance and trustworthiness of the information found in relation to healthcare?
…critically appraise the information found in relation to healthcare?
…interpret statistical and epidemiological data in research reports relevant to patient care/healthcare?
…conform with referencing requirements and avoid plagiarism in essays, dissertations and project reports?
I.10. Ethics and professionalism
Are you able to…
…promote the good of every patient in a caring, compassionate, and confidential manner?
…respect the autonomy and dignity of each patient?
…act with honesty and integrity in all professional matters?
…respect the values and abilities of others?
…take responsibility for your own decisions and actions in academic and patient care environments?
…adhere to written and unwritten dress codes at the University and when going on placements?
I.11. Reflective practice and Continuing professional development
Are you able to…
….reflect on performance and feedback throughout the learning experience (coursework, practicals, workshops)?
…respond openly and positively to feedback from peers, tutors and assessments?
…identify your learning needs to improve performance?
…identify self-directed learning opportunities?
…keep a record of your own development processes and learning experiences?
…engage in developing your professional competence?
II. DELIVERY OF PATIENT CARE COMPETENCIES
II.1. Health, illness and patient
Are you able to…
…gather accurate and comprehensive patient information and drug-related data, using relevant sources (patients, healthcare professionals, medical notes, reference books)?
…utilise and integrate knowledge of physiology, pathophysiology and anatomy in order to formulate a therapeutic care plan?
…utilise and integrate knowledge of metabolic pathways for carbohydrates, amino acids and lipids to inform your decisions about formulating a therapeutic care plan?
…utilise and integrate knowledge of metabolism of lipoproteins and the medical problems associated with abnormal lipoprotein levels in order to formulate a therapeutic care plan and select appropriate drug(s) for the management of lipid disorders?
…utilise and integrate knowledge of the role of vitamins and minerals in metabolism and identify reactions utilised by these compounds in order to support your decisions in selecting the appropriate drug?
II.2. Drug specific issues
Are you able to…
…interpret patient and drug-related data needed to identify actual or potential drug therapy problems?
…address and prevent side-effects and toxicities from therapeutic agents by applying knowledge of mechanisms of toxicity?

…solve and prevent drug therapy problems related to dosage form, delivery system, and route of administration? …interpret the importance of adverse drug reactions to patient care? … interpret the importance of drug interactions to patient care? …utilise and integrate knowledge of the chemical stability of a drug under various conditions, and the recommendations of the manufacturers of medicinal products, in order to make recommendations to patients/carers/other healthcare professionals on the most appropriate manner in which to store medications?
II.3. Patient adherence and concordance
Are you able to… …assess patient adherence to previously prescribed medications? …counsel patients and/or carers about drug therapy and proper use of medical devices according to their individual needs and in a timely manner? …discuss how a patient's adherence to treatment can be improved for a better health outcome? ...use knowledge of pharmacological properties of drugs, to increase adherence and improve therapeutic outcome? …encourage patients to engage in decisions about their care? ….use knowledge of pharmacological properties of drugs, to evaluate pharmacotherapeutic regimens? …promote health improvement, wellness and disease prevention?
II.4. Selection of drug
Are you able to… …apply principles of biochemistry to support your decision in selecting the appropriate drug(s)? …apply principles of medicinal chemistry to support your decision in selecting the appropriate drug(s)? …apply principles of pathophysiology to select the appropriate drug(s)? …recognise the pharmacological classification to which a therapeutic agent belongs? …apply principles of pharmacology to select the appropriate drug(s)/ therapeutic agent(s)? …utilise and integrate knowledge of how the chemical structure of drugs influences absorption, distribution, metabolism and excretion in order to select the most appropriate drug(s) …utilise and integrate knowledge of the contribution of specific chemical features to drug stability and solubility in biological fluids and delivery vehicles, in order to determine the appropriate route(s) of drug administration? …select and recommend the best dosage form for a patient? …apply pharmacokinetic and pharmacodynamic principles to select the appropriate dose and dosage schedule to provide the best therapeutic outcome? …assess the impact of a health condition (age, pregnancy, renal or liver disease) on how drugs are metabolised to provide the best therapeutic outcome? …select and use appropriate monitoring data to support decisions related to treatment?
II.5. Provision of drug product
Are you able to… …evaluate if a patient's treatment is appropriate, safe and effective to ensure a good patient care outcome? …ensure the clinical and legal validity of prescriptions? …assure that there is no excessive medication use or unnecessary drug duplication in prescribing? …identify signs or potential indicators of drug misuse or abuse? …verify safety and accuracy utilising pharmaceutical calculations? …accurately prepare and dispense medication(s) prescribed? …correctly complete legally required records in the process of dispensing medicines?

II.6. Communication with patients, carers and other healthcare professionals
Are you able to… …actively and empathetically listen to patients, carers and healthcare professionals and synthesise relevant information? …verbally communicate a complex concept, idea, educational message or recommendation persuasively in appropriate terms, using correct English? …communicate a complex idea, educational message or recommendations persuasively in appropriate terms in writing, using correct English? …confirm patient/carer/ healthcare professional understanding of information communicated and clarify if needed?

4.7 Summary

An iterative process was used to develop the PDF. It involved pharmacy academics, stakeholders in pharmacy and pharmacy education as well as pharmacy students. The short period of time between focus groups, workshops or interviews did not allow the researcher to make all the changes recommended by participants between two consecutive versions of the PDF but they were taken into account in later stages of the development of the PDF. The iterative process adopted in the development of the PDF and the involvement of pharmacy academics, stakeholders and students ensured the face and content validity of the PDF. Following the development, the use of the PDF was evaluated with third and fourth year MPharm students in the UK (section 5.1).

5 EVALUATION OF THE USE OF THE PROFESSIONAL DEVELOPMENT FRAMEWORK

In the previous chapter the development of the PDF for MPharm students was described. This chapter will describe the evaluation of the use of the PDF. It will include a description of the methods used in order to evaluate the use of the PDF and then the results of the evaluation. The timing of the events in the evaluation is presented in Figure 5.1. The aim of this phase of the research was to evaluate the use of the PDF by:

- describing MPharm students' self-assessed competence by using the PDF
- comparing their self-assessed competence with their objectively assessed performance;
- identifying MPharm students' self-directedness towards learning and describing how this relates to their self-assessed competence;
- comparing MPharm students' self-directedness towards learning with their performance;
- describing MPharm students' and stakeholders' perceptions of the PDF; and
- making recommendations about how the PDF could be used in the future.

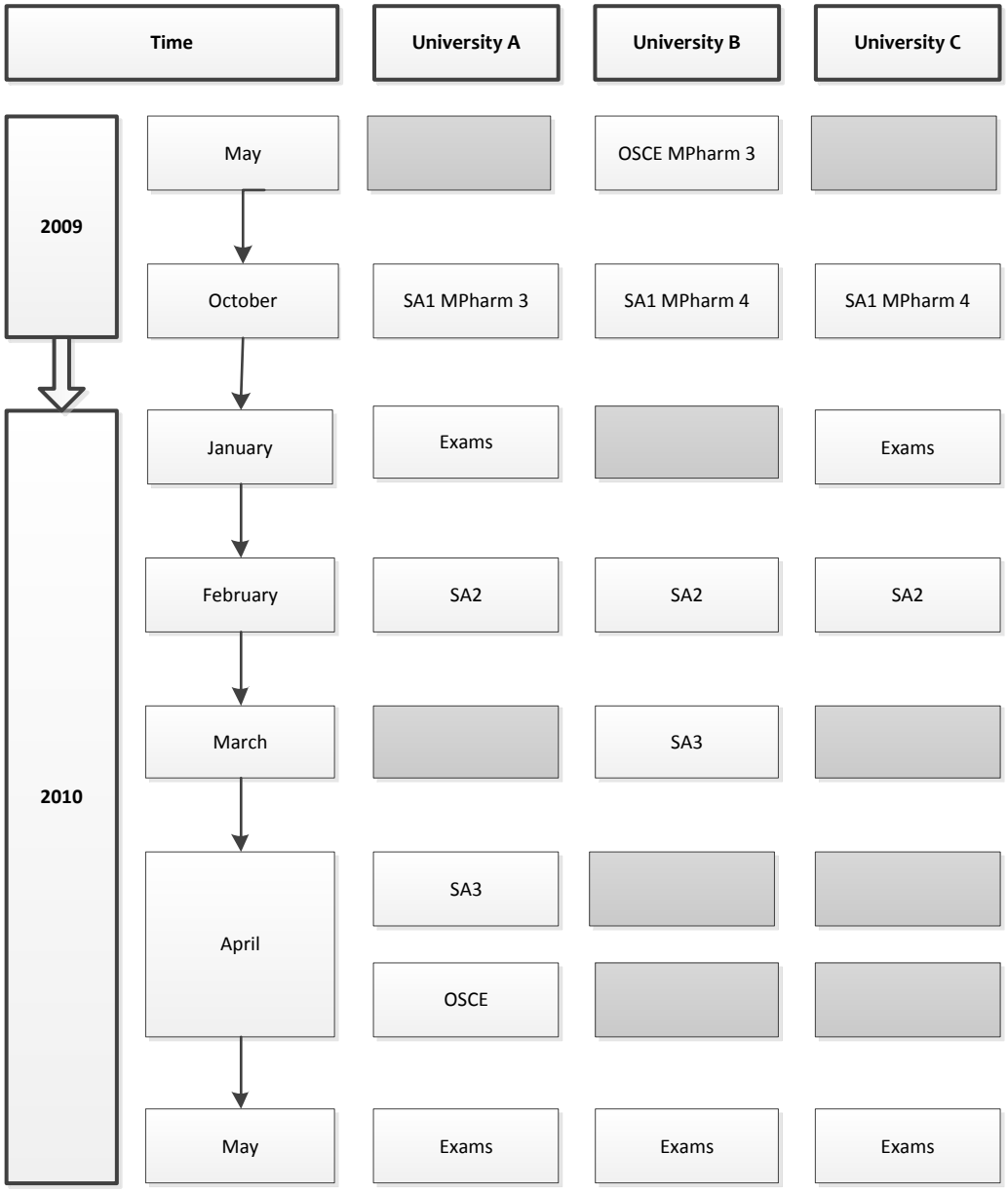

Figure 5.1 Evaluation of the use of the PDF: sequence of the events (OSCE=Objective Structured Clinical Examination, SA1=first self-assessment using the PDF, SA2= second self-assessment using the PDF, SA3=third self-assessment using the PDF)

5.1 Evaluation of the use of the PDF: overview

The use of the PDF was evaluated in three schools of pharmacy in England in the academic year of 2009 – 2010. Whole cohorts of either third or fourth year students, depending on their respective school of pharmacy, were approached to participate in the evaluation. These students were considered to have a better understanding of the competencies and behavioural indicators encompassed in the PDF than first

and second year students as they had completed two or three years of study. It would have been ideal to recruit only fourth year students as they should have developed all the competencies required during the MPharm degree or should be developing them in the final year. However, whilst in university C students have their OSCEs in their fourth year, in universities A and B the OSCE was arranged in the third year. Therefore, third year students were recruited from university A and fourth year students from university B and C. The implications and the uses of the OSCE in the context of the evaluation are discussed below.

The research team considered it appropriate to ask students to complete the PDF two or three times during the academic year of 2009-2010. Similarly, pharmacists using the GLF were asked to self-assess their competencies three times within a year (Mills *et al.*, 2005). Students would have to review their competencies and think about their development. The period of time between the reviews was decided based on students' timetable in each school of pharmacy involved in the research project. It was considered that a period of time of at least two months between two self-assessments of their competence by using the PDF would be enough to ensure that students would not remember their answers from the previous self-assessment. Additionally students had exams, practical and theoretical classes in between the two self-assessments, and they were not given copies of their completed PDFs. This way it was considered they would not remember their answers to previous self-assessments. However, students might have learned what was expected of them and self-assessed their competence at the level they thought was expected of them rather than the actual level. As the self-assessment was a subjective assessment, an objective assessment, such as exam results, was used in triangulation (section 3.5) to evaluate the use of the PDF and students' ability to self-assess their competencies.

The OSCE has been shown to be a valid, reliable and feasible way of measuring the clinical competence of pharmacy trainees (McRobbie, 1996) and is used at present in different schools of pharmacy across the UK to assess the clinical competence of pharmacy students. The "Delivery of Patient Care Competencies" cluster of the PDF focuses on the application of theory into clinical practice. One hypothesis was that in a comparison between this and the OSCE, greater self-assessed competence

measured by the PDF should be correlated with higher OSCE marks and vice versa. If so, this could then provide evidence on the construct validity of the PDF. It was also considered that the pharmacy practice exams might integrate much of the PDF content and might be positively associated with greater competence as measured in the PDF. Additionally, the students' self-assessment of their competencies was compared with their overall performance in their respective year of study. The PDF questionnaire used in the evaluation will be described in the next section.

5.2 The PDF questionnaire used in the evaluation

PDF (v4) whose development was described in chapter 4 was given to the selected student cohorts in all three schools of pharmacy together with a section on student demographics (Appendix 23), and a self-directed learning section (SDL). The section on student demographics was included in the first assessment but not included in the second assessment. In the third assessment the document contained a section on some students' demographics, related only to fourth year students (Appendix 24)

5.2.1 The PDF questionnaire: demographics section

Data on students' demographics were collected to describe the students' background and to explore any potential associations and/or differences between the characteristics and the students' self-assessed competence, self-directed learning and objectively assessed performance.

Questions about student demographics were adapted from the demographic section of the Course Experience Questionnaire (CEQ), developed for the IPSF Moving On II research project (Appendix 25), by the researcher, together with another member of the research team. The second and third questionnaires developed for the second and third assessment respectively did not contain the demographics section, as students were encouraged to complete a shorter version, which would take them less time to complete.

Also students were asked to give their student number which allowed the researcher to track all their responses and the exam results. However, all data was coded prior to the analyses and anonymity of the students guaranteed. The Data Protection Officer at university A was contacted about these issues. The Data Protection Officer agreed that students could be asked to provide their student number and not their names in order to reduce the identity issue. The researcher did not have access to students' names. As advised by the Data Protection Officer at university A it was explained to students why their student number was needed, and they were told they could opt not to provide their student number if they so wished. The above issues were explained to students both orally, when the PDF was introduced as well as in the information sheet.

5.2.2 The PDF questionnaire: self-directed learning section

The research team perceived that students' self-directedness towards learning might influence their perceived level of competence. Therefore, the last section of the questionnaire explored students' self-directedness towards learning (SDL). The SDL section was adapted, by the researcher and another member of the research team, from a validated self-directed learning readiness scale developed for nursing education (Fisher, King, & Tague 2001) and the section on "Personal development" from the Joint Programmes Board (JPB) questionnaire "The evaluation of practitioners' experiences with the Postgraduate Diploma in Pharmacy Practice Programme" (Abdel-Tawab, 2007). Five of the 13 items were adapted from the article by Fisher, King and Tague (2001) and eight were adapted from the JPB questionnaire. A five point Likert scale ranging from strongly agree to strongly disagree, was used (Appendix 23). The SDL section was employed to explore any associations between the students' self-directedness towards learning and their self-assessed level of competence and their exam performance.

5.3 Recruitment of participants

This section will describe the recruitment of participants involved in the evaluation of the use of the PDF.

5.3.1 Recruitment of participating schools of pharmacy

The recruitment of the schools of pharmacy, by which the use of the PDF was evaluated, was described in section 4.1.1. In all schools of pharmacy the PDF and its purpose was described to students during a common lecture and students were given information sheets. Subsequently, in universities A and C students were emailed the link to the online questionnaire, whereas in university B students were given paper copies of it.

5.3.2 Recruitment of pharmacy students at university A

In contrast with the other participating schools of pharmacy, at university A purposive sampling was used to approach the 129 third year MPharm students in the academic year of 2009 – 2010. Information about the PDF was presented to students during a common lecture on CPD and competence. At the end of the lecture the students received an information sheet (Appendix 26) and a copy of the PDF for the students to keep. It was also explained that the self-assessment of their competencies using the PDF would take place three times during the academic year. A link to the online questionnaire together with the information sheet was posted on the virtual learning environment, by a member of the research team. Students were also explained that participation was voluntary. The online version of the PDF was developed using a web-based survey tool called "Survey Monkey"® for ease of administration.

5.3.3 Recruitment of pharmacy students at university B

In university B, the OSCEs are arranged at the end of the third year (Figure 5.1). Thus, purposive sampling was used to approach third year MPharm students at university B in the academic year of 2008 – 2009. They were asked to complete the first self-assessment using the PDF in May 2009. There were 89 students in their third year who were going to be in their fourth year in the academic year of 2009 – 2010, when they were asked to complete the next two self-assessments. A recruitment email (Appendix 27) together with an information sheet (Appendix 26) were emailed to students a week before the first scheduled self-assessment and the OSCE by one of the members of the research team. This was followed up with a reminder email a day before the assessment. Students were also told that participation was voluntary.

Additionally, purposive sampling was used to recruit pharmacy students at university B to participate in a focus group in order to explore their views upon their experience of using the PDF. Thus, upon completion of the third self-assessment, final year students were approached and asked if they would like to participate in a focus group (FG6) which would explore their views of the PDF. A recruitment email together with an information sheet and a consent form (Appendix 11) was sent by one of the members of the research team to all final year students at university B. The aim was to conduct a maximum of three parallel focus groups with 6-8 participants facilitated by the researcher and the two other researchers who reviewed the topic guide. The other two researchers were experts in the field. A topic guide was developed by the researcher and reviewed for its face and content validity by two other researchers who agreed with the topics encompassed in the topic guide (Appendix 27). The topic guide was developed to facilitate the participants to discuss their perceived views upon the use of the PDF and recommendations for future improvement. Those participants who attended the focus group were asked to give informed consent for their participation and recording the focus groups at the beginning of the focus groups.

5.3.4 Recruitment of pharmacy students at university C

In university C, purposive sampling was used to approach the 112 fourth year pharmacy students, in the academic year of 2009 – 2010. These students were on placements and at university, in rotation, starting from October 2009 and until the end of April 2010. It was thought that the placements might influence their perceived level of competence. Therefore, it was decided to have two assessments, a baseline assessment in October 2009, before any of the students went on placements, and a second assessment in April 2010, after they had all come back from their placements. The OSCEs were arranged after each group of students came back from the placements.

Information about the research was presented to fourth year students at a common lecture related to the placements. Those students who attended the lecture were given an information sheet (Appendix 26) and to those students who did not, the information sheet was sent in an email from an academic member of staff in Pharmacy Practice at university C. During the lecture it was explained that the self-assessment of students' competencies would take place twice during the academic year. Similarly to university A an online version of the PDF, developed using "Survey Monkey"® was used for ease of administration.

5.3.5 Recruitment of stakeholders

Stakeholders were recruited to participate in interviews, which explored, amongst others, their views upon the use of a PDF for MPharm students and how it could be implemented in the MPharm degree. The recruitment process and the development of the topic guide are described in section 4.5.2.

5.3.6 Recruitment of academics and teaching staff at university A

At university A purposive sampling was used to recruit academic and teaching staff from pharmacy practice to support students in understanding the aim and structure of the PDF and to explain how the rating scale was used. The aim was to recruit 12 academics, as there were 12 student groups. Members of the research team suggested members of the academic and teaching staff within pharmacy practice who might be able to help. The identified members of the academic and teaching staff were contacted via email to explain their role within the research. The members of the academic and teaching staff who agreed to participate will be referred to as "tutors" from here onwards. Training was provided by the researcher to all volunteer tutors. The structure of the PDF, its aim, the use of the rating scale and the tutors' role during the tutorials were explained during the tutorials. Tutors were sent a tutorial guide (Appendix 29) a week before the training session to ensure they had time to familiarise themselves with the guide and to clarify any questions they might have had during the training session. The development of the tutorial guide is presented below.

5.3.6.1 The development of the guide for the tutorials with students at university A

The initial version of the guide for the first tutorial encompassed six sections which will be described below. The first section included a small questionnaire on students' learning styles in order to help students identify their preferred way of learning. It was thought that if students could identify their preferred way of learning it would support them in their learning and development whilst at the university. The second section focused on explaining to students the definition of competence. The research team decided it was important for students to know what competence is before they started to self-assess their own competence. The following section aimed to support students in understanding how the PDF works by using as an example the "Professional Competencies" cluster. The fourth section of the guide asked students to give an example of a competency they think they need to improve. The research team perceived that this exercise might help students in understanding how the PDF would help them. The fifth section of the

guide aimed to give students a brief description of the research project whilst the last section aimed to clarify some ethical aspects of the research.

After training the tutors, the researcher and another member of the research team revised the initial version of the guide for the first student tutorial and developed the final version of the guide (Appendix 29). It was decided to remove the discussion about the definition of competence, as this would have been already presented to students when the PDF was introduced to them and also given to them in the PDF document. In the final version of the guide, a topic related to the explanation of the use of the rating scale (section 4.6.5) and an exercise for students to rate themselves in the "Ethics and professionalism" competency were added. This was done in order to ensure students understand how to use the rating scale to self-assess their competence. In the section relating to "students' examples of competencies they need to improve" instead of thinking about competencies they thought they needed to improve, students were asked to look at their ratings in the "Ethics and professionalism" competency and to identify the behavioural indicator(s) of the competency where they rated themselves the lowest. The research team perceived that this exercise might support students better in understanding how to use the PDF. The tutors were asked to guide students to the University Student Support website if they needed support with any of the competencies within the "Professional competencies" cluster and to their respective courses in the MPharm degree if they needed support in developing or improving any of the competencies within the "Delivery of Patient Care" cluster. The rest of the topics remained the same as in the initial version of the guide. The guide for the first tutorial was reviewed for its face and content validity by a member of the research team who agreed with the topics encompassed in the guide.

Tutors were asked to inform the researcher of any issues that needed further explanation, difficulties that students had, or any further support students would have liked to have had. This information was used to develop a guide for the second tutorial.

A guide for tutors for the second tutorial was developed by the researcher (Appendix 30). It encompassed four sections. The aim of the first section was to provide an overview of the first tutorial in order to remind students about it whilst the next section introduced them to the second tutorial. The following section underlined to students the usefulness of the PDF. The last section of the guide for the second tutorial encompassed an exercise which asked students to indicate their level of confidence in the competencies encompassed in the PDF.

The second guide comprised a "tutor note sheet" in which tutors were asked to take notes during the tutorial when indicated to do so, and a "worksheet" for students, to allow them to write down their answers to the exercises encompassed in the guide. These were collected at the end of the tutorial by the tutors. The guide for the second tutorial was reviewed for its face and content validity by a member of the research team who agreed with the topics encompassed in the guide.

5.4 Data collection in the evaluation of the use of the PDF

The use of the PDF was evaluated in three schools of pharmacy. The process used to evaluate the PDF in these universities is described below.

5.4.1 Evaluation of the use of the PDF at university A

At university A both members of the academic and teaching staff and students were involved in the evaluation of the use of the PDF. The academic and teaching staff were recruited to support students in self-assessing their competencies and they gave two tutorials, in October 2009 and February 2010, to the students.

At university A the self-assessment was not part of the students' course and participation was voluntary. The students met the tutors twice during the academic year, in October 2009, after the common lecture, and in February 2010, for support. The tutorials were scheduled over a period of two weeks in both October 2009 and February 2010. In October 2009 the students were given two weeks, after the date

of the last tutorial, to complete the online PDF. After the first week, the students were emailed a reminder.

After their second tutorial, in February 2010, students were sent, via the virtual learning environment, a link to the questionnaire. Students were told during the tutorial but also in a reminder email that a prize draw would take place for those students who completed the self-assessments in February and April 2010. Due to the low response rate, the deadline was extended for another week. Another reminder was emailed to students by the Director of Studies and an announcement also made by an academic member of staff during a common lecture.

For the third self-assessment in April 2010, a slightly different approach was taken. Student groups were allocated a time, as part of another workshop, to complete the third self-assessment. This time they were given a hard copy of the PDF that they were asked to hand in after the workshop if they wanted to participate in the research project.

5.4.2 Evaluation of the use of the PDF at university B

A presentation was prepared for the students, to introduce the PDF and also to explain how to use the rating scale to self-assess their competencies. The students had three options. As the participation was voluntary, they could have opted not to complete the PDF, completed the PDF but not allowed the researcher to have access to their exam results, in which case they were asked to tick a box at the end of the PDF to indicate so, or completed the PDF and allowed the researcher to have access to all their exam results, in which case completing the PDF and not ticking the box implied that access was given to the exam results. In the end none of the students completed the PDF for various reasons and another plan for recruitment was developed.

In the academic year of 2009 – 2010, the self-assessment of competence by using the PDF became a compulsory exercise as part of the fourth year CPD Portfolio for 110 students (some students were repeating the final year). Most of these students had been in their third year in the academic year of 2008-2009. In October 2009 the

students were approached at the end of a CPD introductory lecture and given a copy of the PDF together with an information sheet (Appendices 23 and 26) so that they could take an informed decision about their participation in the research project. It was made clear to the students that the completion of the PDF was compulsory, but it was voluntary to participate in the research. Thus, they could indicate their non-participation in research as well as if they allowed or not the researcher access to their exam results at the end of the PDF. Students were given a week to complete and submit the PDF to the teaching office at university B.

It was also explained that the self-assessment would take place twice more during the academic year, in early February, after exams, and in late March 2010, before the final exams, when copies of the PDF were administered to students following the same procedure as before.

5.4.3 Evaluation of the use of the PDF at university C

Similarly to university A, at university C the self-assessment was not part of the students' course. The online version of the PDF was introduced during the common lecture and instructions were given about how to access and complete. The students were told that participation was voluntary and if they wanted to complete the PDF but did not want to allow the researcher access to their exam results they should indicate so at the end of the online PDF. The senior lecturer emailed all students the link to the online survey after the lecture.

Students were given two weeks to complete the online version of the PDF. A reminder, developed by the researcher and emailed by the senior lecturer in Pharmacy Practice, was sent to students after a week. Due to the low response rate, the deadline was extended by another week.

5.5 Data handling and analysis

Data from the questionnaires were coded and entered in SPSS (version 18). A summary of the comparisons done and the statistical tests employed is presented in Figure 5.2. An in depth description of the tests employed is provided in section 3.4. For analysing the part of the interviews and focus groups that related to stakeholders' views upon a PDF for MPharm students its implementation in the MPharm degree and students' experience of using the PDF framework analysis was used. A description of the process is given in section 3.4.

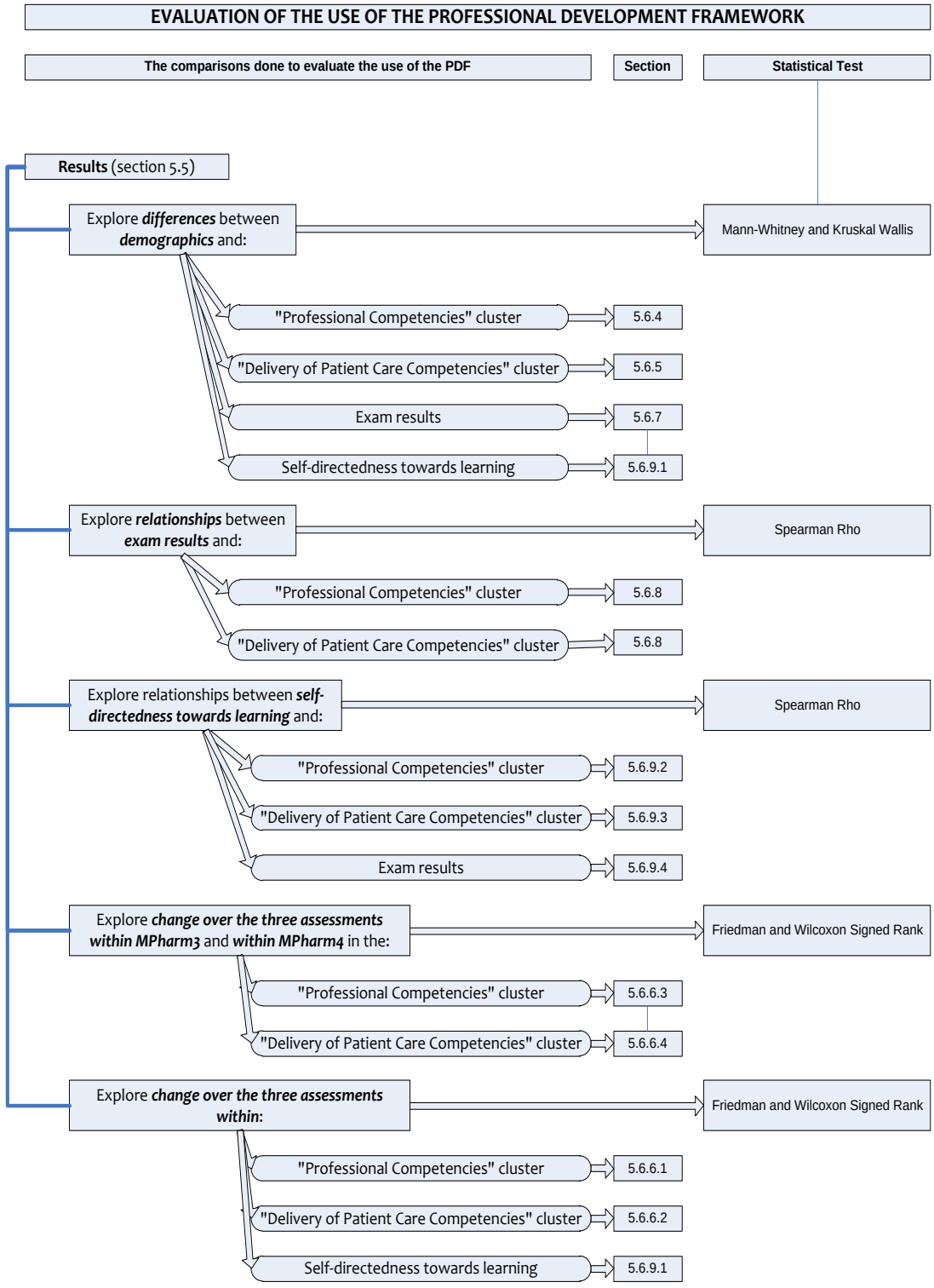

Figure 5.2 Summary of the evaluation of the use of the PDF and the statistical tests done

5.6 Results: evaluation of the use of the PDF

This section presents the results and analysis undertaken to evaluate the use of the PDF. First, demographic data is presented. Subsequently these data are compared with the "Professional competencies" cluster and the "Delivery of patient care competencies", with students' exam results and with their self-directedness towards learning results (Figure 5.3). The latter is also compared with their self-assessed competencies in the two clusters as well as with their exam results. MPharm students self-assessed competencies in the two clusters were also compared with their exam results. The statistically significant differences found are presented in detail in this section.

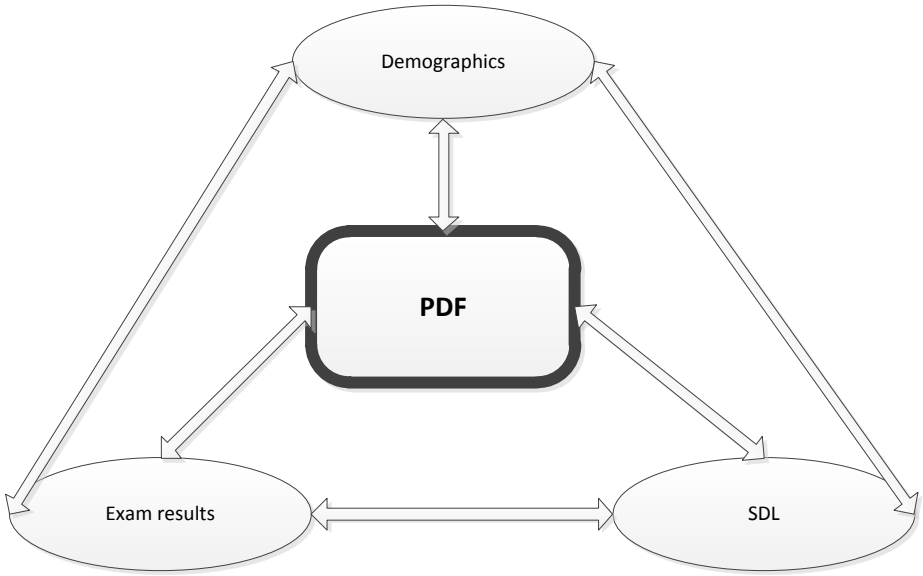

Figure 5.3 Summary of the comparisons done in order to evaluate the use of the PDF

5.6.1 Sample

In universities A and B the PDF was administered to the same cohort of students three times during the academic year 2009-2010 whilst in university C the PDF was administered once as afterwards it withdrew from the research. Table 5.1 shows the response rate within each of the three assessments. Overall, across the three assessments, 829 PDFs were administered, of which 387 were to third year students

and 442 to fourth year students. Overall, 511 responses were received, a response rate of 62% of the whole sample.

Table 5.1 Response rate in each of the three self-assessments

Overall %(n/N)	1st assessment (SA1[2]) % (n/N)	2nd assessment (SA2[3]) %(n/N)	3rd assessment (SA3[4]) % (n/N)
62 (511/829)	57 (199/351)	53 (126/239)	78 (186/239)

After the first assessment (SA1), university C withdrew from the study. A description of the numbers of responses who completed more than one self-assessment is given in Table 5.2. These numbers do not include responses from university C.

Table 5.2 Response rates for students who completed at least two self-assessments

SA1 and SA2 % (n/N)	SA1 and SA3 % (n/N)	SA2 and SA3 %(n/N)	SA1 and SA2 and SA3 % (n/N)
45 (107/239)	56(134/239)	42(100/239)	35(84/239)

5.6.2 Non-respondents

In total, out of 829 administered questionnaires, 306 were not completed. In SA1 162 were not completed, 113 were not completed in SA2 and 53 were not completed in SA3.The attrition in the second assessment might have been influenced by the fact that in university B the PDF was a mandatory part of the programme whilst at university A the PDF was not mandatory. This might indicate that if the PDF is not part of the curriculum students might not use it. In SA3, in an attempt to increase the response rate, students for whom the PDF was not part of the curriculum (i.e. University A) were asked to complete a paper version of the PDF and were allocated a time within a workshop to do this and offered an opportunity to enter into a £50 prize draw.

[2] SA1=First self-assessment using the PDF
[3] SA2= Second self-assessment using the PDF
[4] SA3=Third self-assessment using the PDF

5.6.3 Demographic data

Demographic data were collected in SA1 (section 5.2.1) but not in SA2 and SA3. Thus, this section presents the summary of the demographic data of MPharm students who completed at least SA1. The demographics are not known for the students who completed only SA2 or SA3, or SA2 and SA3.However, as students were asked to provide their student numbers, for those who did so the researcher was able to track all their responses and the exam results (section 5.2.1).

A summary of the respondents' characteristics is presented in Table 5.3. In all the three assessments the majority of the respondents were female which agrees with national data that the majority of MPharm students are female. This is also confirmed by the gender split in the pharmacy workforce census (Seston, 2009). The majority of students were born in the UK and did not have any previous degree. Most students did not have a part time job during term time, and those who did have one, mostly did not work in a healthcare related area. In contrast, most students had a part-time job during the summer and that job was in a healthcare related area. Thus, overall, the majority of the students had had a part time job in a healthcare related area. Associations between the demographic data were explored. No statistically significant associations were found. Thus, it might be assumed that any differences in self-assessed competency, SDL or exam results were not confounded by existing differences in demographics.

In the next section demographic data will also be compared with the competencies encompassed in the "Professional Competencies" cluster and in the "Delivery of Patient Care" cluster in each of the three assessments.

Table 5.3 Demographic of the students participating in the evaluation of the use of the PDF

		SA1 %(n/N) N=199	SA2 %(n/N) N=126	SA2 %(n/N) N=186
University	C	10 (19/199)	----------	----------
	A	46(92/199)	26 (33/126)	57 (105/186)
	B	44(88/199)	74 (93/126)	43 (81/186)
Missing data		-	-	-
Year study				
	3	46 (92/199)	26 (33/126)	56 (105/186)
	4	54 (107/199)	74 (93/126)	44 (81/186)
Missing data		-	-	-
Gender				
	Female	71 (140/198)	71 (77/108)	72 (97/135)
	Male	29 (58/198)	29 (31/108)	28 (38/135)
Missing data[5]		1	18	51
Place of birth				
	UK	65 (126/193)	74 (78/105)	68 (89/132)
	Europe	5 (10/193)	4 (4/105)	2 (3/132)
	Outside Europe	30 (57/193)	22 (23/105)	30 (40/132)
Missing data		6	21	54
Previous degree				
	Yes	5 (10/199)	4 (4/108)	2 (3/135)
	No	95 (189/199)	96 (104/108)	98 (132/135)
Missing data		-	18	51
Part time job during term time				
	Yes	29(57/199)	30 (32/108)	29 (39/135)
	No	71(142/199)	70 (76/108)	71 (96/135)
Missing data		-	18	51
Part time job during term time healthcare related				
	Yes	48(30/63)	68 (23/34)	41 (18/44)
	No	52(33/63)	32 (11/34)	59 (26/44)
Missing data		136	92	142
Part time job during summer				
	Yes	73(143/197)	70 (74/106)	75 (100/133)
	No	27(54/197)	30 (32/106)	25 (33/133)
Missing data		2	20	53
Part time job during summer healthcare related				
	Yes	84(119/141)	85 (62/73)	84 (82/98)
	No	16(22/141)	15 (11/73)	16 (16/98)
Missing data		58	53	88
Part time job				
	Yes	76(152/199)	74 (80/108)	78 (106/135)

[5] Missing data in SA2 and SA3 might be the number of respondents for whom there is no demographic data as they did not complete SA1. Additionally, missing data has also come from students who gave incomplete answers.

No	24(47/199)	26 (28/108)	22 (29/135)
Missing data	-	18	51
Part time job healthcare related			
Yes	83(125/151)	87 (66/76)	80 (85/106)
No	17(26/151)	13 (10/76)	20 (21/106)
Missing data	48	50	80
Pharmacy first choice of university course			
Yes	79(158/199)	81 (88/108)	80 (108/135)
No	14(28/199)	13 (14/108)	16 (21/135)
Unsure	7(13/199)	6 (6/108)	4 (6/135)
Missing data	-	18	51
Encouragement by family or friends to study pharmacy			
Yes	67(133/199)	65 (70/108)	70 (94/135)
No	26(52/199)	31 (33/108)	24 (32/135)
Unsure	7(14/199)	4 (5/108)	6 (9/135)
Missing data	-	19	53
Desire to do postgraduate studies			
Yes	19(37/197)	17 (18/107)	16 (21/133)
No	36(72/197)	41 (44/107)	37 (49/133)
Unsure	45(88/197)	42 (45/107)	47 (63/133)
Missing data	2	19	53

5.6.4 The "Professional Competencies" cluster

This section explores relationships between competencies encompassed in the "Professional Competencies" cluster and respondent demographics (**Figure 5.4**).

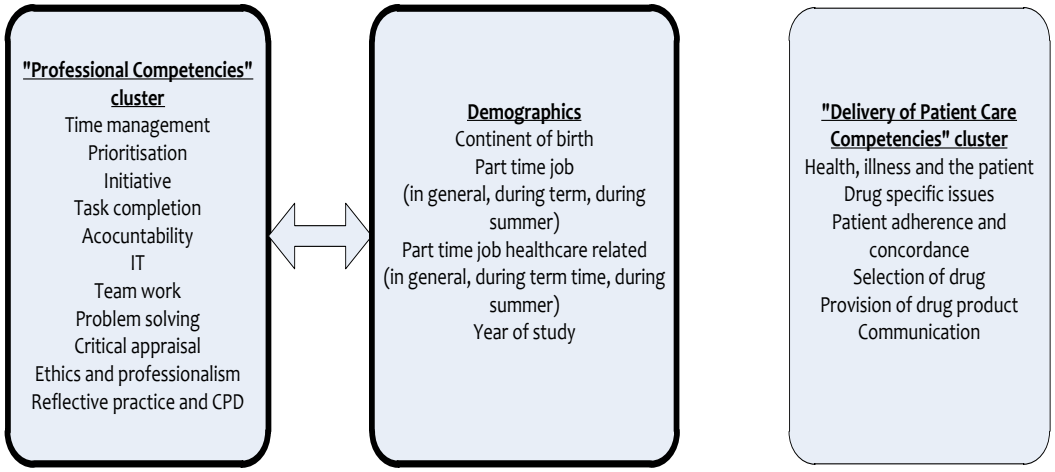

Figure 5.4 Summary of the explorations done between the "Professional Competencies" cluster and demographic data

Table 5.4 shows the median and mean scores of the competencies encompassed in the "Professional Competencies" cluster in the three self-assessments. There was an apparent increase in all the competencies in students' self-assessment from the first to the third assessment. The third and fourth year students had internalised the need for professional conduct even as pharmacy students: accountability and ethics and professionalism competencies had the highest self-assessed scores throughout the academic year and there was little scope for improvement. In contrast, there was room for improvement in critical appraisal relevant to patient care, reflective practice and CPD and problem solving competencies which showed the lowest overall median self-assessed scores in SA1. However, in all competencies, the mean score of students self-assessed level of competence indicates an increase over the three self-assessments.

In the next sections (5.6.4.1 to 5.6.4.5) the statistically significant differences identified between demographics and the competencies within the "Professional Competencies" cluster will be presented in detail..

Table 5.4 Median and mean scores of students' self-assessment in the three assessments in the "Professional Competencies" cluster

Professional competencies	Whole cohort						MPharm3						MPharm4					
	SA1		SA2		SA3		SA1		SA2		SA3		SA1		SA2		SA3	
	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean
Time management	3.00	3.29	3.50	3.48	3.50	3.55	3.00	3.20	3.50	3.31	3.00	3.23	3.50	3.39	3.50	3.50	4.00	3.61
Prioritisation	3.00	3.13	3.00	3.27	3.00	3.41	3.00	2.90	3.00	3.10	3.00	3.09	3.00	3.24	3.00	3.33	4.00	3.51
Initiative	3.00	3.19	3.00	3.19	3.00	3.31	3.00	2.92	3.00	3.03	3.00	3.00	3.00	3.20	3.00	3.22	3.00	3.42
Task completion	3.00	3.11	3.00	3.20	3.00	3.32	3.00	2.95	3.00	3.00	3.00	3.08	3.00	3.15	3.00	3.27	4.00	3.49
Accountability	4.00	3.48	4.00	3.47	4.00	3.45	3.00	3.18	4.00	3.45	3.00	3.39	4.00	3.53	4.00	3.47	4.00	3.55
Information technology	3.00	3.25	3.50	3.52	3.50	3.52	3.50	3.27	3.50	3.41	3.50	3.30	3.50	3.35	3.50	3.52	4.00	3.60
Team work	3.00	3.33	3.00	3.27	3.25	3.30	3.00	2.97	3.00	3.02	3.00	3.01	3.00	3.49	3.50	3.39	3.50	3.39
Problem solving	3.00	2.95	3.00	3.09	3.00	3.16	3.00	2.74	3.00	2.83	3.00	2.89	3.00	2.98	3.00	3.18	3.00	3.26
Critical appraisal relevant to patient care	3.00	2.62	3.00	2.95	3.00	3.19	2.50	2.40	3.00	2.76	3.00	2.97	3.00	2.78	3.00	3.05	3.00	3.24
Ethics and professionalism	4.00	3.77	4.00	3.74	4.00	3.77	3.50	3.44	4.00	3.48	4.00	3.67	4.00	3.87	4.00	3.79	4.00	3.80
Reflective practice and CPD	3.00	2.92	3.00	3.10	3.00	3.27	2.50	2.58	3.00	2.75	3.00	2.80	3.00	3.01	3.00	3.22	3.50	3.47
"Professional Competencies" cluster overall	3.00	3.19	3.50	3.46	3.00	3.38	3.00	3.00	3.50	3.31	3.00	3.09	3.00	3.24	3.00	3.09	3.50	3.50

5.6.4.1 Continent of birth and the "Professional Competencies" cluster

In SA1 students who were born in Europe rated themselves higher in self-assessed competency than those who were born outside Europe in:

- "time management"; medians were 3.50 and 3.00 and means were 3.50 and 3.23 respectively (U = 154.000, z = 2.395, p = 0.017);

Whilst it is known where the students were born, it is noted that they might have completed their education in their place of origin or elsewhere. It was expected that those students who were born in UK or Europe and completed their education in the UK would have a better understanding of the UK practice, thus, to self-assess their competencies higher than those who were born and completed their education outside Europe.

In SA2 no statistically significant differences were found between students. On the other hand, in SA3 students who were born in the UK rated their competencies higher than those who were born outside Europe in the following competencies

- "time management" medians were 4.00 and 3.00 and means were 3.58 and 3.23 respectively (U = 1332.500, z = 2.545, p = 0.011);
- "problem solving" both medians were 3.00 but means were 3.19 and 3.08 respectively (U = 1429.500, z = 2.353, p = 0.019);
- "ethics and professionalism" both medians were 4.00 but means were 3.81 and 3.64 respectively (U = 1400.000, z = 2.638, p = 0.008); and
- "communication with patients, carers and other healthcare professionals" both medians were 4.00 and means were 3.54 and 3.41 respectively (U = 1355.000, z = 2.418, p = 0.016).

5.6.4.2 Any part time job and the "Professional Competencies" cluster

The part time job presented in this subsection includes any jobs, that is, jobs during summer and term time as well as those within or without healthcare. In SA1 MPharm students who had *any* part time job self-assessed their competency higher (Mdn=3.00; Mean=3.19) than those who did not have one (Mdn=3.00; Mean=3.04) overall in the "Professional Competencies" cluster (U=2901.500, z=2.217, p=0.027). Moreover, the same was observed for the "initiative" competency (medians both 3.00 and means 3.08 and 2.80 respectively) in SA1 (U=2834.500, z=2.381, p= 0.017). These findings might indicate that any part time work might support students in developing some of their professional competencies.

Furthermore, in SA2 MPharm students who had *any* part time job rated themselves higher in three competencies than students who did not have one (Table 5.5). These findings might indicate that a part time job might support students with organising their time, prioritising tasks and being accountable for the tasks they are undertaking.

Table 5.5 Second assessment: comparison of self-assessed competency and part time job in the "Professional Competencies" cluster (median competency scores presented)

Professional Competencies Cluster 2nd assessment	Part time job (Mdn; mean)	No part time job (Mdn; mean)	Difference between groups
Time management	3.50 ; 3.47	3.00 ;3.26	U=952.000,z=2.006, p= 0.045
Prioritisation	3.00 ;3.33	3.00 ; 3.06	U=959.000, z=2.122, p=0.034
Accountability	4.00 ;3.51	3.00 ;3.23	U=937.500, z=2.246, p=0.025

Interestingly, in SA2 MPharm students whose part time job was not in a healthcare related area any time of the year self- assessed themselves higher (Mdn=4.00) than those whose part time job was in a healthcare related area (Mdn=3.00) in the "task completion" competency (U=257.000, z=2.384, p= 0.017). This might indicate the fact that in a healthcare related job the students might not have focused on completing tasks but possibly on other patient related issues. Whilst the self-assessment in SA1 might have been influenced by a part time job during summer, in

SA2 and SA3 the influence of a job either during the summer or term time, might have been confounded, taking into account that some students might have had jobs during term time before they completed SA1 or indeed after they completed SA1. The details of these jobs remain unknown.

5.6.4.3 Part time job during term time and the "Professional Competencies" cluster

In SA1 MPharm students who had *any* part time job *during term time* (Mdn=3.00; mean=3.34) self-assessed themselves higher overall in the "Professional Competencies" cluster than those who did not have one (Mdn=3.00; mean= 3.08) (U=2995.500, z=3.266, p=0.001) cluster. This was also observed for four competencies in SA1 (Table 5.6) and for three competencies in SA2 (Table 5.7). No statistically significant differences were found between the competencies within the "Professional Competencies" cluster and a part time job during term time in SA3. These findings might suggest that any part time job during term time supports students in developing their professional competencies. It was interesting to notice that students self-assessed their competency higher in these areas if they had a part time job during term time. However, a part time job during term time might be a burden for students as it is not part of their degree.

Table 5.6 SA1: comparison of self-assessed competency and any part time job during term time, in the "Professional Competencies" cluster

Professional Competencies Cluster 1st assessment	Part time job during term time (Mdn; mean)	No part time job during term time (Mdn; mean)	Difference between groups
Time management	3.50 ; 3.40	3.00; 3.24	U=3344.500; z=1.997, p= 0.046
Prioritisation	3.00 ; 3.29	3.00; 3.04	U=3273.000; z=2.381, p=0.017
Task completion	3.00; 3.28	3.00; 3.01	U=3160.500; z=2.919, p=0.004
Team work	3.00; 3.43	3.00; 3.21	U=3347.000; z=2.122, p=0.034

Table 5.7 SA2: comparison of self-assessed competency and any part time job during term time in the "Professional Competencies" cluster

Professional Competencies Cluster 2nd assessment	Part time job during term time (Mdn; mean)	No part time job during term time (Mdn; mean)	Difference between groups
Accountability	4.00 ; 3.69	3.00; 3.37	U=937.500, z=2.713 p= 0.007
Team work	3.50 ; 3.48	3.00 ; 3.16	U=873.000, z=2.651, p=0.008
Ethics and professionalism	4.00; 3.89	4.00; 3.68	U=1062.500, z=2.311, p=0.021

Overall, in SA3 MPharm students whose *part time job during term time was healthcare related* (Mdn=3.50) rated themselves higher overall in the "Professional Competencies" cluster (U=353.500, z=2.208, p=0.027) than those who had a job but not a healthcare related one (Mdn=3.00). Additionally, these students with a part time job during term time in a healthcare related area self-assessed their competency higher than those with a non-healthcare related part time job during term time in two competencies in SA1 (Table 5.8) and four competencies in SA3 (Table 5.9). In contrast, no statistically significant differences were found between having a healthcare related part time job or a non-healthcare related job during term time and SA2. Having a healthcare related part time job during term time offered students the possibility to come into contact with patients and other healthcare professionals which might have made MPharm students more aware of the importance of reflective practice and CPD, which was sustained from SA1 to SA3. At University B students had been engaged in CPD activities from the first year of their degree, which might have also influenced students' self-assessment. At University A students were also engaged in such activities but to a lower degree. The ethics and professionalism was one of the competencies which had the highest self-assessed scores throughout the academic year (Table 5.9). However, the healthcare related part time job during term time ensured higher self-assessed competency. Furthermore, the healthcare related part time job during term time ensured higher self-assessed problem solving competencies, which was one of the competencies with the lowest overall average score in the self-assessed competence (Table 5.9).

Table 5.8 SA1: comparison of self-assessed competency and healthcare related part time job during term time, in the "Professional Competencies" cluster

Professional Competencies Cluster 1st assessment	Part time job during term time HC related (Mdn; mean)	Part time job during term time not HC related (Mdn; mean)	Difference between groups
Critical appraisal	3.00; 2.88	2.50; 2.62	U=344.000, z=2.236, p=0.025
Reflective practice and CPD	3.00; 3.11	2.75; 2.68	U=330.000, z=2.361, p=0.018

Table 5.9 SA3: comparison of self-assessed competency and healthcare related part time job during term time, in the "Professional Competencies" cluster

Professional Competencies Cluster 3rd assessment	Part time job during term time HC related (Mdn; mean)	Part time job during term time not HC related (Mdn; mean)	Difference between groups
IT	4.00 ; 3.69	3.50 ; 3.50	U=368.500, z=1.999, p=0.046
Problem solving	3.00 ; 3.25	3.00 ; 3.08	U=366.500, z=2.057, p=0.040
Ethics and professionalism	4.00 ; 3.94	4.00 ; 3.76	U=357.500, z=2.281, p=0.023
Reflective practice and CPD	3.00 / 3.33	3.00 / 2.96	U=321.500, z=2.655, p=0.008

5.6.4.4 Part time job during summer and the "Professional Competencies" cluster

In SA2 MPharm students who had had *any part time job during the summer* rated themselves higher in the "initiative" competency (Mdn=3.00; Mean=3.25) than those who did not have one (Mdn=3.00; Mean=2.97) (U=1022.500, z=1.989, p= 0.047) and, interestingly, in SA3 lower (medians 3.00 and 4.00, respectively) in the "task completion" competency (U=3230.500, z=2.125, p= 0.034). This might indicate that students might have realised whilst working that they were not that competent in completing tasks on time in "real life" situations when possibly under more pressure. Overall, this finding might indicate that the learning experience whilst at the university should be complemented with work based learning opportunities. The university could focus on equipping students with the knowledge, attitudes and skills whilst the opportunity to practice them in a real life

situation might equip students with the appropriate attitudes and might further develop their skills and abilities.

5.6.4.5 Year of study and the "Professional Competencies" cluster

A comparison between third and fourth year MPharm students was done in order to explore if the PDF captures students' development, thus supporting the construct validity of the PDF. The two cohorts of students were from different universities; thus, have not followed the same MPharm degree. However, the two MPharm degrees were accredited; their curricula comply with the indicative syllabus. It was expected that fourth year students would rate their self-assessed competency higher than third year students but that third year students' self-assessed competency in SA3 and fourth year students' self-assessed competency in SA1 would be similar.

Across all competencies encompassed in the "Professional Competencies" cluster fourth year MPharm students (Mdn=3.00; Mean= 3.28 in SA1 and Mdn=3.00; Mean=3.01 in SA3) rated themselves higher than those who were in their third year (Mdn=3.00 in SA1 and Mdn=3.00 in SA3) in SA1 ($U = 3542.000$, $z = 3.887$, $p<0.0005$) and SA3 ($U = 4750.500$, $z = 6.057$, $p<0.0005$). This was as expected: students' competence is expected to increase from year to year and these findings indicate that the PDF might be a good way of capturing students' perceived learning. Indeed, fourth year MPharm students rated themselves higher on the competency scale than third year MPharm students in most competencies encompassed in the PDF. In SA1 this was observed in nine (Table 5.10), in SA2 in five (Table 5.11) and in SA3 in all 11 competencies (Table 5.12). MPharm students seem to have increasing levels of professional competencies as they progress through the course which is helpful for their future careers. The difference between the year groups, although in two different universities, indicates the PDF's construct validity.

Table 5.10 SA1: comparison of self-assessed competency between year of study and the "Professional Competencies" cluster (median and mean competency scores presented)

Professional Competencies cluster 1st assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Differences between the groups
Prioritisation	3.00 ; 2.96	3.00; 3.25	U=3807.500, z=3.109, p= 0.002
Initiative	3.00; 2.91	3.00; 3.11	U=4164.500, z = 2.083,p =0.037
Task completion	3.00; 2.97	3.00; 3.18	U=4098.500, z = 2.458,p = 0.014
Accountability	3.00; 3.26	4.00; 3.50	U=3962.500, z = 2.553, p = 0.011
Team work	3.00; 2.98	4.00; 3.53	U=2870.000, z =5.641, p<0.0005
Problem solving	3.00; 2.78	3.00; 3.01	U=3770.500, z = 3.360, p =0.001
Critical appraisal	2.50; 2.44	3.00; 2.86	U=2950.000, z = 5.156, p<0.0005
Ethics and professionalism	3.50; 3.49	4.00; 3.84	U=3209.000, z = 5.093, p<0.0005
Reflective practice and CPD	2.50; 2.61	3.00; 3.06	U=3059.000, z = 4.801, p<0.0005

Table 5.11 SA2: comparison of self-assessed competency between year of study and the "Professional Competencies" cluster

Professional Competencies cluster 2nd assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Differences between the groups
Team work	3.00; 2.98	3.50; 3.38	U = 923.500, z = 3.865, p<0.0005
Problem solving	3.00 ; 2.80	3.00 ; 3.18	U = 982.000, z = 4.147, p<0.0005
Critical appraisal	3.00 ; 2.76	3.00 ; 3.07	U = 1109.500, z = 3.141, p=0.002
Ethics and professionalism	4.00 ; 3.50	4.00 ; 3.84	U = 1073.500, z = 3.910, p<0.0005
Reflective practice and CPD	3.00 ; 2.75	3.00 ; 3.27	U = 784.000, z = 4.951, p<0.0005

Table 5.12 SA3: comparison of self-assessed competency between year of study and the "Professional Competencies" cluster

Professional Competencies cluster 3rd assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Differences between the groups
Time management	3.00; 3.22	3.50 ; 3.50	U = 5352.000, z = 4.873, p<0.0005
Prioritisation	3.00; 3.10	3.00 ; 3.46	U = 5450.000, z = 4.781, p<0.0005
Initiative	3.00 ; 2.99	3.00 ; 3.37	U = 5179.500, z = 5.287, p<0.0005
Task completion	3.00 ; 3.10	3.00 ; 3.45	U = 5277.000, z=5.127, p<0.0005
Accountability	3.00 ;3.38	4.00 ;3.52	U = 6032.500, z = 3.752, p<0.0005
IT	3.50 ;3.31	4.00 ; 3.56	U = 5468.000, z = 4.650, p<0.0005
Team work	3.00; 2.98	3.50 ; 3.40	U = 4793.500, z = 5.801, p<0.0005
Problem solving	3.00 ; 2.90	3.00 ; 3.32	U = 4562.000, z = 6.452, p<0.0005
Critical appraisal	3.00 ; 2.95	3.00 ; 3.29	U = 5073.500, z = 5.390, p<0.0005
Ethics and professionalism	4.00 ; 3.69	4.00 ; 3.82	U = 5770.000, z = 4.376, p<0.0005
Reflective practice and CPD	3.00; 2.80	3.00;3.38	U = 4280.000, z = 6.773, p<0.0005

Furthermore, a comparison was conducted between the self-assessed competence of third year students in SA3 and fourth year students in SA1 to explore if the students at the end of their third year were at a similar stage in their competency development as at the start of their fourth year in different universities. It was expected that third year students' self-assessed competence in SA3 would be at the same level with fourth year students' self-assessed competence in SA1. However, across all the competencies encompassed in the "Professional Competencies" cluster (U=3721; z=2.702; p=0.007), in SA1 fourth year students self-assessed their competency higher (Mdn=3.00; Mean=3.27) than third year students in SA3 (Mdn=3.00; Mean=3.08). Fourth year students self-assessed their competency higher in SA1 than third year students in SA3 in four competencies encompassed in this cluster (

Table **5.13**) but not in the other seven competencies. Indeed, the differences were more marked between the students' SA1 results (Table 5.10). However, these differences might have been influenced by any part time jobs or placements during

the summer the fourth year students might have had. It was also known that more emphasis was given to learning about CPD in university B than in university A which may account for one of the differences. Third year MPharm students had had a year long course in pharmacy practice which was also part of their curricula in their second year. Additionally, they had CPD lectures as part of their induction in the first year as well as in their third year. For fourth year MPharm students CPD is a strong theme in their teaching. They have a number of workshops and individual work related to CPD throughout their programme.

Table 5.13 Comparison between self-assessed competency of MPharm3 in SA3 and MPharm4 in SA1

Professional Competencies cluster	SA3 MPharm 3 (Mdn; mean)	SA1 MPharm 4 (Mdn; mean)	Differences between the groups
Team work	3.00; 2.98	3.50; 3.50	U =2574.000, z = 5.663 p<0.0005
Problem solving	3.00; 2.90	3.00; 3.00	U =4093.000, z = 1.961 p=0.050
Ethics and professionalism	4.00; 3.69	4.00; 3.82	U = 3942.500, z = 2.490 p=0.013
Reflective practice and CPD	3.00; 2.80	3.00; 3.05	U =3725.500, z=2.700 P=0.007

5.6.4.6 Summary

A summary of the findings related to the comparison between competencies encompassed in the "Professional Competencies" cluster and demographic data is presented in Table 5.14.

Table 5.14 Summary of the findings related to the comparison between "Professional Competencies" cluster and demographic data

▪ Having any part time job during term time influenced the students' self-assessed level of competence in competencies encompassed in the "Professional Competencies" cluster; ▪ Gender and holding a previous degree did not have any influence on students' self- assessed level of competence; ▪ The PDF showed the differences in the self-assessed level of competence of MPharm students in the "Professional Competencies" cluster both within and between third and fourth year MPharm students

5.6.5 The "Delivery of Patient Care Competencies" cluster

This section explores relationships between the competencies encompassed in the "Delivery of Patient Care Competencies" cluster and respondents' demographics (**Figure 5.5**). In the next sections (5.6.5.1 to 5.6.5.6) a detailed description of the statistically significant findings is given.

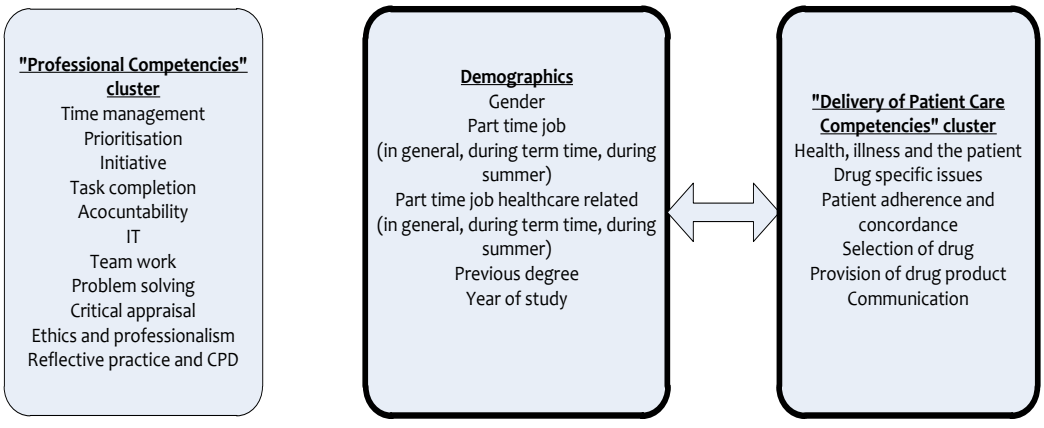

Figure 5.5 Summary of the explorations done between the "Delivery of Patient Care Competencies" cluster and demographic data

MPharm students' self-assessed competence in the competencies encompassed in the "Delivery of Patient Care Competencies" cluster increased over the three

assessments (Table 5.15). In the majority of the competencies encompassed in the "Delivery of Patient Care Competencies" cluster students did not self-assess their competence at level four (always) in this cluster. This might suggest that level four (always) might not be achievable in the MPharm degree. Thus, during their undergraduate studies students might be expected to achieve a level three (usually), which they did and continue their development during the pre-registration year which should be taken into account if the five year integrated programme will be introduced. There was an apparent increase in all the competencies in students' self-assessment from the first to the third assessment. For fourth year MPharm students there was little scope for improvement in the communication with patients, carers and other healthcare professionals. In contrast there was room for improvement in the competency related to health, illness and the patient which showed the lowest overall self-assessed score over the three assessments.

Table 5.15 Median and mean scores of students' self-assessment in the three assessments in the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care Competencies	Whole cohort						MPharm3						MPharm4					
	SA1		SA2		SA3		SA1		SA2		SA3		SA1		SA2		SA3	
	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean	Mdn	Mean
Health, illness and the patient	2.00	2.13	3.00	2.44	3.00	2.78	2.00	1.95	2.00	2.24	2.00	2.37	2.00	2.29	3.00	2.53	3.00	2.93
Drug specific issues	3.00	2.67	3.00	2.96	3.00	3.09	2.50	2.45	3.00	2.90	3.00	2.85	3.00	2.87	3.00	2.96	3.00	3.23
Patient adherence and concordance	3.00	2.73	3.00	2.95	3.00	3.16	2.00	2.34	3.00	2.76	3.00	2.88	3.00	2.98	3.00	3.02	3.00	3.31
Selection of drug	2.50	2.47	3.00	2.64	3.00	2.84	2.00	2.10	2.00	2.55	3.00	2.54	3.00	2.67	3.00	2.71	3.00	3.04
Provision of drug product	3.00	3.27	3.00	3.25	3.00	3.30	3.00	2.75	3.00	3.07	3.00	3.09	3.00	3.44	3.00	3.31	3.00	3.42
Communication with patients, carers and other healthcare professionals	3.50	3.33	3.00	3.39	4.00	3.47	3.00	2.88	3.00	3.07	3.00	3.29	4.00	3.53	4.00	3.49	4.00	3.60
Delivery of patient care competencies overall	3.00	2.79	3.00	2.44	3.00	3.11	2.25	2.46	2.00	2.24	3.00	2.87	3.00	2.99	3.00	2.53	3.00	3.27

5.6.5.1 Gender and the "Delivery of Patient Care Competencies" cluster

In contrast to the "Professional Competencies" cluster, where no gender related statistically significant differences were found, in SA1 male students rated themselves higher in two out of six competencies encompassed in this cluster than female students (Table 5.16). This difference was not sustained inSA2 and SA3.

Table 5.16 SA1: comparison of self-assessed competency between gender and the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care cluster	Female (Mdn; mean)	Male (Mdn; mean)	Difference between groups
Health, illness and the patient	2.00 ; 2.10	3.00 ; 2.54	U=2395.000, z=3.450, p= 0.001
Drug specific issues	2.50 ; 2.60	3.00 ; 2.78	U=3143.000, z=2.020, p=0.043

5.6.5.2 Part time job and the "Delivery of Patient Care Competencies" cluster

The part time job discussed in this subsection includes *any job that is jobs during summer and term time as well as those within or without healthcare*. Whilst in SA1 and SA2 no statistically significant differences were found between students who had *any part time job* and those who did not have one, in SA3, MPharm students who had *any part time job* (Mdn=3.00; Mean=2.96) self-assessed their competency lower than those who did not have one (Mdn=3.00; Mean= 3.21) in the "drug specific issues" competency (U=2972.000, z=2.073, p= 0.038). However, the information about the part time job was from SA1 and students may or may not have had a part time job in SA3. This finding might indicate that a part time job may not allow students sufficient time for learning. However, it is important to remember that the information on jobs related to data gathered in conjunction with SA1.

5.6.5.3 Part time job during term time

In SA1 (U=3252.000, z=2.032, p= 0.042) students who had *any part time job during term time* (Mdn=3.00; Mean= 3.33) self-assessed their competency higher than those who did not have one (Mdn=3.00; Mean=3.10) in the "communication with patients, carers and other healthcare professionals" competency. Similarly, in SA3 (U=346.000, z=2.354, p= 0.019) this was observed when comparing students who had a *healthcare related part time job during term time* (Mdn=4.00; Mean=3.72) with those whose *part time job during term time* was not in a healthcare related area (Mdn=3.00; Mean=3.36). These findings indicate that a part time job during term time, especially healthcare related, might support students in developing their competency related to communication. It might indicate that a job offers students the possibility to practise this competency whilst, at the same time, it encourages them to develop and improve it.

In SA2 MPharm students who had any part time job during term time rated themselves higher in three competencies than those who did not have one (Table 5.17). One of these was the above mentioned communication competency. A job gives opportunities to communicate with people from varied backgrounds and not just other students and university staff.

Table 5.17 SA2: comparison of self-assessed competency between part time job during term time and the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care cluster 2nd assessment	Part time job during term time (Mdn; mean)	No part time job during term time (Mdn; mean)	Difference between groups
Drug specific issues	3.00 ; 3.14	3.00 ; 2.87	U=1002.000, z=2.134, p= 0.033
Patient adherence and concordance	3.00 ; 3.21	3.00 ; 2.88	U=956.500, z=2.198, p= 0.028
Communication with patients, carers and other healthcare professionals	4.00 ; 3.59	3.00 ; 3.30	U=959.000, z=2.345, p= 0.019

5.6.5.4 Part time job during the summer

Having *any part time job during the summer* did not seem to have influenced students' perceived level of competency. In SA3 MPharm students who did not have a part time job during summer self-assessed their competency higher than those students who did have one in two competencies (Table 5.18). Whilst in SA2 those students who had a part time job during term time self-assessed their competency higher than those who did not have one, in SA3 those students who did not have a part time job during summer self-assessed their competency higher than those who had one. This might indicate that combining the learning during term time with practice might have a higher impact on students rather than having just the practice alone.

Table 5.18 SA3: comparison of self-assessed competency between part time job during term time and the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care Competencies Cluster 3rd assessment	Yes, part time job during summer (Mdn; mean)	No part time job during summer (Mdn; mean)	Difference between groups
Drug specific issues	3.00 ; 2.93	3.00 ; 3.21	U=3120.000, z=2.411, P= 0.016
Selection of drug	3.00 ; 2.67	3.00 ; 3.00	U=3238.000, z=2.090, P= 0.037

5.6.5.5 Previous degree and the "Delivery of Patient Care Competencies" cluster

Holding a previous degree seemed to have influenced MPharm students' self-assessed competence in the "selection of drug competency". Students who had a previous degree (Mdn=3.00; Mean=2.86) rated themselves higher than those who did not have one (Mdn=3.00; Mean=2.78; U=596.500, z=2.100, p= 0.036), irrespective of the area of their previous degree. This finding might suggest that students who had a previous degree were more confident in their competencies. On the other hand, students who have a previous degree are older. Thus, being mature students might have contributed to their higher self-assessment in this competency.

5.6.5.6 Year of study and the "Delivery of Patient Care Competencies" cluster

The aim was to explore if the PDF shows students' development. Across all the competencies encompassed in the "Delivery of Patient Care Competencies" cluster fourth year MPharm students rated themselves higher than those who were in their third year, in SA2 (medians were 3.00 and 2.00 respectively; U= 1096.500, z=2.683, p=0.007) and SA3 (medians were 3.00 and means were 3.26 and 2.89 respectively; U= 4794.500, z=5.937, p<0.0005). In SA1 and SA3 fourth year MPharm students rated themselves higher in all six competencies than third year MPharm students (Table 5.19; Table 5.21) and in SA2 in four competencies (Table 5.20). The difference between the year groups, although in two different universities, indicates the PDF's construct validity. In the competency related to communication fourth year MPharm students had reached level 4 (always) already in SA1. Whilst this might indicate that they reached the required level of this competence in the MPharm degree, they would still have to improve it by continuing practising it. However, in all the rest of the competencies both third and fourth year students did not reach level four (always) of the rating scale. Whilst for third year MPharm students this might mean more work in developing these competencies, for fourth year MPharm students it might mean that they should address these competencies during their pre-registration year. This finding further emphasises the idea that the PDF is a tool to support learning and development.

Table 5.19 SA1: comparison of self-assessed competency between year of study and the "Delivery of Patient" cluster

Delivery of Patient Care cluster 1st assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Difference between groups
Health, illness and the patient	2.00 ; 1.93	2.50 ; 2.45	U=2755.000, z=4.523, p<0.0005
Drug specific issues	2.50 ; 2.47	3.00 ; 2.81	U=3289.000, z=3.814, p<0.0005
Patient adherence and concordance	2.00 ; 2.36	3.00 ; 3.00	U=2631.500, z=5.599, p<0.0005
Selection of drug	2.00 ; 2.12	3.00 ; 2.65	U=2800.500, z=5.148, p<0.0005
Provision of drug product	3.00; 2.79	3.00 ; 3.37	U=2704.000, z=5.915, p<0.0005
Communication with patients, carers and other healthcare professionals	3.00 ; 2.86	4.00 ; 3.42	U= 2752.000, z=5.527 , p<0.0005

Table 5.20 SA2: comparison of self-assessed competency between year of study and the "Delivery of Patient" cluster (median and mean competency scores presented)

Delivery of Patient Care cluster 2nd assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Difference between groups
Health, illness and the patient	2.00 ; 2.26	3.00 ; 2.65	U=1096.500, z=2.683, p=0.007
Selection of drug	2.00 ; 2.53	3.00 ; 2.86	U=1029.000, z=3.252, p=0.001
Provision of drug product	3.00 ; 3.06	3.00 ; 3.42	U=1139.500, z=2.545, p=0.011
Communication with patients, carers and other healthcare professionals	3.00 ; 3.06	4.00 ; 3.51	U= 1019.000, z=3.228 , p=0.001

Table 5.21 SA3: comparison of self-assessed competency between year of study and the "Delivery of Patient" cluster

Delivery of Patient Care cluster 3rd assessment	MPharm 3 (Mdn; mean)	MPharm 4 (Mdn; mean)	Difference between groups
Health, illness and the patient	2.00 ; 2.32	3.00 ; 2.98	U=4817.000, z=5.877, p<0.0005
Drug specific issues	3.00 ; 2.86	3.00 ; 3.23	U=4838.500, z=5.802, p<0.0005
Patient adherence and concordance	3.00 ; 2.85	3.00 ; 3.29	U=5197.000, z=5.317, p<0.0005
Selection of drug	3.00 ; 2.57	3.00 ; 3.04	U=5015.000, z=5.544, p<0.0005
Provision of drug product	3.00 ; 3.08	3.00 ; 3.41	U=5313.500, z=5.097, p<0.0005
Communication with patients, carers and other healthcare professionals	3.00 ;3.31	4.00 ;3.59	U= 5521.500, z=4.669 , p<0.0005
Delivery of patient care competencies	3.00 ; 2.89	3.00 ; 3.26	U= 4794.500, z=5.937 , p<0.0005

However, a comparison was done between the self-assessed competence of third year students in SA3 and fourth year students in SA1 to explore if the students at the end of their third year were at a similar stage in their competency development as at the start of their fourth year. It is expected that third year students' self-assessed competence in SA3 would be at the same level with fourth year students' self-assessed competence in SA1. Fourth year students (Median=3.00; Mean=3.37) self-assessed their competency higher in the "provision of drug product" competency in SA 1 (U=3498.500; z=3.497; p<0.0001) than third year students in SA3 (Median=3.00; Mean=3.08). However, this difference might have been influenced by part time jobs or placements during the summer.

5.6.5.7 Summary

A summary of the comparison between competencies encompassed in the "Delivery of Patient Care Competencies" cluster and demographics data can be found in Table 5.22.

Table 5.22 Summary of the findings related to the comparison between the "Delivery of Patient Care Competencies" cluster and demographic data

- Similar to the findings in the "Professional Competencies" cluster, the year of study influenced competencies in the "Delivery of Patient Care Competencies" cluster;
- The part time job during term time, similarly to the findings in the "Professional Competencies" cluster, influenced the development of competencies in the "Delivery of Patient Care Competencies" cluster;
- A healthcare related part time job during summer did not have any influence on students' self-assessed level of competence, however the healthcare related part time job during term time did influence the self-assessed level of competence;
- In contrast with the "Professional Competencies" cluster , gender and the previous degree influenced students' self-assessed level of competence in the "Delivery of Patient Care Competencies" cluster;
- Overall, both third and fourth year students self-assessed level of competence decreased from the first to the second assessment, but increased again in the third assessment;
- The PDF captured the differences in the self-assessed level of competence of MPharm students in this cluster both within and between third and fourth year students, emphasising the construct validity of the PDF.

5.6.6 Evaluation of the use of the PDF: change in the self-assessed competency score over the three self-assessments

This section explores the change over time in the whole student cohorts' self-assessed competency in the two clusters, Professional and Delivery of patient care competencies, as well as the changes within both years of study. The number of responses received in SA1 and SA2; SA2 and SA3; SA1 and SA3 is presented in Table 5.2.

5.6.6.1 Changes over the three self- assessments in the "Professional Competencies" cluster

In the whole cohort of participants, in the "Professional Competencies" cluster, change over time was observed in four out of 11 competencies in this cluster from SA1 to SA2 and SA2 to SA3 (Table 5.23).These findings might suggest that students might face difficulties in self-assessing their professional competencies. This might be due to the lack of or too little feedback being given to students on their professional competencies. Thus, the self-assessment of these competencies requires a good insight of one's own competence and characteristics. However, as shown in
Table **5.4**, fourth year students' self-assessed competency was higher than third year students' indicating progress from one year to the next.

Table 5.4 showed that in SA1 MPharm students' self-assessed level of competence in the competencies encompassed in the "Professional Competencies" cluster was at level four (always) in only two of the competencies (accountability and ethics and professionalism). However, overall, students tended to rate themselves successively higher on the competency scale from SA1 to SA3, implying an increase in their performance over time. The PDF detected some improvement in students' self-assessed level of competency in the "Professional Competencies" cluster by the end of the academic year. This finding emphasises once again the construct validity of the PDF.

Table 5.23 Changes over time observed in the "Professional Competencies" cluster

Professional competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Time management	---	---	---
Prioritisation	---	---	---
Initiative	---	---	---
Task completion	---	---	---
Accountability	---	---	---
Information technology	SA1 < SA2 p= 0.003	---	---
Team work	---	---	---
Problem solving	SA1 < SA2 p=0.019	---	---
Critical appraisal relevant to patient care	SA1 < SA2 p<0.0005	SA2 < SA3 p<0.0005	
Ethics and professionalism	---	---	---
Reflective practice and CPD	SA1 < SA2 p<0.0005	---	---
Overall	---	---	SA1 < SA3 p=0.014

5.6.6.2 . Changes over the three self- assessments in the "Delivery of Patient Care Competencies" cluster

In the "Delivery of Patient Care Competencies" cluster changes were observed in the majority of the competencies (four out of six competencies from SA1 to SA2 and SA2 to SA3) in this cluster (Table 5.24). Additionally, students rated themselves higher on the competency scale overall from SA1 to SA3, showing an increase in their performance over time. At the same time these findings might suggest that students focus more on developing their Delivery of patient care competencies rather than the Professional competencies, as they might perceive that this is what is expected of them as future pharmacists. However, students' self-assessed competency in the "Professional Competencies" cluster was higher than in the "Delivery of Patient Care Competencies" cluster. Students might receive more feedback on competencies related to Delivery of patient care at least in the form of exam results, and thus, these competencies might be easier for them to self-assess.

Table 5.24 Changes over time observed in the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care Competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Health, illness and the patient	SA1 < SA2 p= 0.001	SA2 < SA3 p<0.0005	---
Drug specific issues	SA1 < SA2 p<0.0005	---	---
Patient adherence and concordance	---	SA2 < SA3 p=0.010	---
Selection of drug	SA1 < SA2 p<0.0005	SA2 < SA3 P=0.007	
Provision of drug product	---	---	---
Communication with patients, carers and other healthcare professionals	---	---	---
Overall	SA1 > SA2--- p<0.0005	---	SA1 < SA3 p<0.0005

Students' overall level of competency in the "Delivery of Patient Care Competencies" cluster in SA1 was higher than in SA2 (p<0.0005). The mid-term exam results, which were received by students prior to the completion of SA2, might have affected this. If the exam results were less than expected it might have had a negative impact on the students, whilst if these were higher than expected the opposite might have happened. On the other hand, SA2 might have been more truthful than SA1 as students could reflect on their performance in the exams. However, the findings indicated an improvement in the students' development of their Delivery of patient care related competencies from SA1 to SA3, both of which were done prior to exams. This finding indicates again that the PDF is a tool that might capture students' development.

5.6.6.3 Changes in the self-assessed level of competency within the year of study over time and the "Professional Competencies" cluster

Third year students' self-assessed competency in only critical appraisal improved statistically over time (Table 5.25). Students reported the lowest self-assessed level of competency in critical appraisal. Indeed, change was expected in this competency as students completed a literature review as part of their third year in university A, reflecting once again the construct validity of the PDF. For these

students the self-assessment of their competencies using the PDF was not part of their programme.

Table 5.25 Differences found across time in the self-assessed competency of third year MPharm students in the competencies encompassed in the "Professional Competencies" cluster

Professional competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Time management	---	---	---
Prioritisation	---	---	---
Initiative	---	---	---
Task completion	---	---	---
Accountability	---	---	---
Information technology	---	---	---
Team work	---	---	---
Problem solving	---	---	---
Critical appraisal relevant to patient care	SA1 < SA2 p=0.002	SA2 < SA3 p=0.028	SA1 < SA3 p<0.0005
Ethics and professionalism	---	---	---
Reflective practice and CPD	---	---	---
Overall	---	---	---

Fourth year MPharm students self-assessed themselves higher in six of the Professional competencies as the academic year progressed (Table 5.26). This might be because they matured, or that the change is more marked in the fourth year, as it might take four years to develop these competencies and to realise that one has developed them. Additionally, for these students the self-assessment of their competency using the PDF was part of their programme. In two of the competencies (accountability and ethics and professionalism) students' self-assessed level of competence was already high, four (always), thus, no change was expected and it did not occur (

Table **5.4**).Whilst changes were expected also in the other competencies (time management, information technology and team work), they were not statistically significant (

Table **5.4**). Change was expected and it did occur in students self-assessed level of competency in problem solving and critical appraisal as they conducted their

research project. Indeed, students' self-assessed level of competency in these two competencies was amongst the lowest at the beginning of their fourth year (
Table **5.4**). Overall, these findings indicate that the PDF captures fourth year MPharm students' development of the competencies encompassed in the "Professional Competencies" cluster.

Table 5.26 Differences found across time in the self-assessed competency of fourth year MPharm students in the competencies encompassed in the "Professional Competencies" cluster

Professional competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Time management	---	---	---
Prioritisation	---	---	SA1 < SA3 p<0.0005
Initiative	---	SA2 < SA3 p= 0.023	SA1 < SA3 p= 0.003
Task completion	---	SA2 < SA3 p= 0.016	SA1 < SA3 p= 0.011
Accountability	---	---	---
Information technology	---	---	---
Team work	---	---	---
Problem solving	SA1 < SA2 p= 0.001	---	SA1 < SA2 p<0.0005
Critical appraisal relevant to patient care	SA1 < SA2 p= 0.004	SA2 < SA3 p= 0.006	SA1 < SA3 p<0.0005
Ethics and professionalism	---	---	---
Reflective practice and CPD	SA1 < SA2 p= 0.008	---	SA1 < SA3 p<0.0005
Overall	SA1 < SA2 p= 0.003	---	SA1 < SA3 p= 0.003

5.6.6.4 Changes in the self-assessed competency within the year of study over time and the "Delivery of Patient Care Competencies" cluster

The third year students' self-assessed competency improved statistically over time in five out of six competencies encompassed in the "Delivery of Patient Care Competencies" cluster (Table 5.27). Students seemed to make progress in the development of Delivery of patient care related competencies. Students' self-

assessed level of competency in communication was already four (always) at SA1. These findings might indicate that the teaching approaches used to support students in developing these competencies are efficient.

In order to minimise the Hawthorne effect, the assessments took place at an interval of a couple of months (sections 5.4 and 5.4.2). Students had neither a hard copy of the PDF, nor a copy of their previously completed PDFs. However, students had exams and teaching periods between the assessments, which might have increased students' awareness relating to their performance.

The "health, illness and the patient" and the "selection of drug" were the competencies in which students' self-assessed competency was the lowest. Students are expected to develop in this competency. The PDF captured students' development of the competencies encompassed in the "Delivery of Patient Care Competencies" cluster especially those in which students indicated the lowest self-assessed competence.

Table 5.27 Differences found across time in the self-assessed competency of *third year MPharm students* in the competencies encompassed in the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care Competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Health, illness and the patient	SA1 < SA2 p= 0.016	---	SA1 < SA3 p<0.0005
Drug specific issues	SA1 < SA2 p= 0.001	---	SA1 < SA3 p<0.0005
Patient adherence and concordance	SA1 < SA2 p= 0.011	---	SA1 < SA3 p<0.0005
Selection of drug	SA1 < SA2 p= 0.040	---	SA1 < SA3 p<0.0005
Provision of drug product	SA1 < SA2 p= 0.035	---	SA1 < SA3 p=0.001
Communication with patients, carers and other healthcare professionals	---	---	---
Overall	---	SA2 <SA3 p= 0.002	SA1 < SA3 p<0.0005

Changes over time in the "Delivery of Patient Care Competencies" cluster were also explored for fourth year MPharm students who made statistically significant progress in the development of four competencies encompassed in this cluster (Table 5.28). For these students the self-assessment of their competency using the PDF was part of their programme and they might have been inclined to pay more attention to thinking about their performance (section 5.4.2). As with third year students, these students did not have a copy of the previously completed PDFs. No statistically significant changes were found over time in the provision of drug product and communication competencies. As students' self-assessed level of competence in the latter was already four (always) at SA1 no statistically significant change was expected during the year. Some non-significant improvement over time was observed in the students' competence related to provision of drug product (Table 5.15). This finding might also indicate that students lack the practical experience of working in a pharmacy.

Table 5.28 Differences found across time in the self-assessed competency of *fourth year MPharm students* in the competencies encompassed in the "Delivery of Patient Care Competencies" cluster

Delivery of Patient Care Competencies	SA1 compared with SA2	SA2 compared with SA3	SA1 compared with SA3
Health, illness and the patient	SA1 < SA2 p= 0.015	SA2 < SA3 p<0.0005	SA1 < SA3 p<0.0005
Drug specific issues	SA1 < SA2 p= 0.004	SA2 < SA3 p= 0.025	SA1 < SA3 p= 0.001
Patient adherence and concordance	---	SA2 < SA3 p= 0.005	SA1 < SA3 p= 0.001
Selection of drug	SA1 < SA2 p= 0.003	SA2 < SA3 p= 0.009	SA1 < SA3 p<0.0005
Provision of drug product	---	---	---
Communication with patients, carers and other healthcare professionals	---	---	---
Overall	---	SA2 < SA3 p<0.0005	SA1 < SA3 p= 0.002

5.6.6.5 Summary

A summary of the findings related to MPharm students' self-assessed level of competence over the three self-assessments is presented in Table 5.29.

Table 5.29 Summary of the findings related to the comparison between students' self-assessed competence over the three self-assessments

- Overall, in both clusters, students' self-assessed level of competency increased from SA1 to SA3
- In both the "Professional Competencies" cluster and the "Delivery of Patient Care Competencies" cluster both third and fourth year MPharm students' self-assessed competency increased over the three self-assessment
- The PDF demonstrated the improvement in MPharm students' self-assessed competence over the three self-assessments for both third and fourth year students, emphasising the construct validity of the PDF

5.6.7 Objectively assessed performance and demographics

This section presents the relationships found between the objectively assessed performance and the demographic data to evaluate the use of the PDF (Figure 5.6). For the third year MPharm students the objectively assessed exams that were of interest were the OSCE and pharmacy practice exam results as well as the overall exam results. For fourth year MPharm students the exam results of interest were the OSCE, pharmacy practice exam and the overall exam results. However, third and fourth year MPharm students were undertaking their MPharm degree at different universities, thus, the curricula are not the same and the exams are not directly comparable. Lastly, the exam results were compared with the self-assessment of their competencies. A detailed description of the findings is given below.

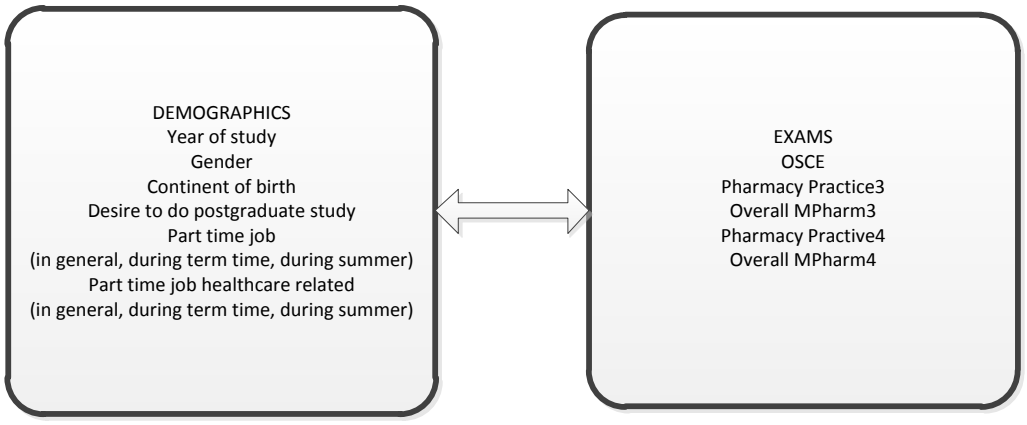

Figure 5.6 Summary of the comparison between demographic data and the exam results

5.6.7.1 The OSCE exam and the demographics

Third year female students (Mdn=65.25) had better OSCE results than male students (Mdn=56.75) (U=338.00, z=2.001, p=0.044). Similarly, third year students who had *any part time job during term time* (Mdn=69.00) had better OSCE results than those students who did not have one (Mdn=61.00). No significant differences were found between fourth year students' OSCE exam results and the collected demographics.

5.6.7.2 The pharmacy practice exam and the demographics

The pharmacy practice exam results, which was undertaken by third year MPharm students in university A were influenced by the students' desire to do postgraduate education. Students who did not want to do any postgraduate education (Mdn=73.00) performed better in pharmacy practice exam (U=181.000, z=2.961, p=0.003) than students who were unsure whether or not they would like to do postgraduate studies (Mdn=64.00).

A healthcare related part time job during term time had been expected to have a positive impact on fourth year MPharm students' performance in their exams, especially for those with jobs related to practice. In contrast, this had a negative effect on fourth year students' performance. Students who did not have a healthcare related part time job during term time (Mdn=69.00) performed better in the pharmacy practice exam (U=15.500, z=2.613, p=0.009) than students who had one (Mdn=61.00). This finding might indicate that fourth year students who have a

healthcare related part time job during term time might not have enough time for studying. Thus, any future training or practice that students might undertake might need to be part of the degree in order to allow students enough time for studying.

5.6.7.3 The year of study overall exam results and the demographics

There was not any statistical significant influence of the demographics on the third year MPharm students' overall exam performance in their third year. This finding might indicate that either the two were not related or that the sample was too small to identify any differences.

In contrast, for fourth year MPharm students, the phenomenon observed in the pharmacy practice exam and the healthcare related part time job during term time was also observed for students' overall exam performance in their fourth year. Students whose part time job during term time was not healthcare related (Mdn=71.00) had a better score for their overall performance in their fourth year (U= 19.500, z=2.335, p=0.020) than students who had a healthcare related part time job during term time (Mdn=66.00). This finding might indicate that a healthcare related part time job during term time might be too demanding, thus students might not have enough time for studying. Students who are willing to take the challenge of a healthcare related part time job during term time, which might be beneficial for them in their future career, might not have enough time for studying. Additionally, it might also suggest that any future training or practice required of the MPharm students should be encompassed within the degree, which might require changes in the structure of the degree.

5.6.7.4 Summary

A summary of the findings related to the comparison between the objectively assessed performance and demographics is presented in Table 5.30.

Table 5.30 Summary of the findings related to the comparison between the objectively assessed performance and demographic data

- Differences were identified between gender and the OSCE results, with female students self-assessing their competence higher than male students
- Third year students who had any part time job during term time had better OSCE results than those students who did not have one
- Third year students who did not want to do postgraduate education as well as those who did not have a healthcare related part time job performed better in the pharmacy practice exam than those who did want to do postgraduate education and those who had a healthcare related part time job during term time, respectively.
- Fourth year students whose part time job during term time was not healthcare related had a better score than those whose part time job during term time was healthcare related

5.6.8 Self-assessed competence and the objectively assessed performance

This section presents the relationships found (or important relationships not found) between the competencies encompassed in the two clusters, Professional and Delivery of patient care competencies, and the exams undertaken by third and fourth year MPharm students (Figure 5.7).

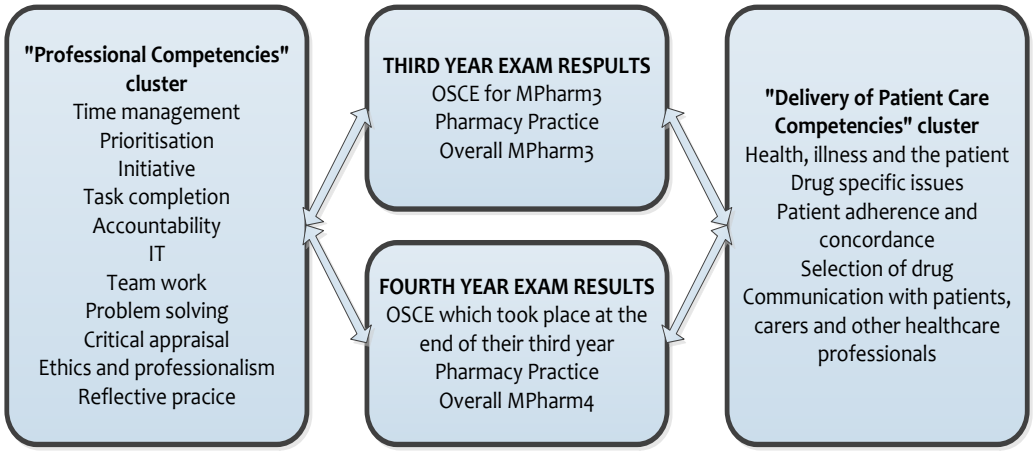

Figure 5.7 Summary of the comparisons between the PDF and the exam results

5.6.8.1 Third year exam results and the self-assessed competence

This section gives a detailed description of the correlations found between the exams, undertaken by third year MPharm students, of interest for the research (OSCE, pharmacy practice and overall third year exam results) and the competencies encompassed in the "Professional Competencies" cluster (Table 5.31) and in the "Delivery of Patient Care Competencies" cluster, respectively. For third year MPharm students the exams took place at the end of their third year, after SA3, hence, this is the only measure for which the correlations were explored.

Positive correlations were found between the OSCE exam and one competency from the "Professional Competencies" cluster, high levels of the self-assessed competency was associated with better performance in the OSCE exam (**Table 5.31**). Better results in the pharmacy practice exam were associated with high levels in six competencies within the "Professional Competencies" cluster. Additionally, students' better overall exam performance was associated with high levels of self-assessed competency in six of the competencies in SA3.

Table 5.31 Correlations between "Professional Competencies" cluster and the third year exam results

"Professional Competencies" cluster SA3	OSCE	Pharmacy Practice	Overall exams
Time management	--	r=0.26; p=0.001	r=0.28; p=0.001
Prioritisation	--	r=0.38; p<0.0005	r=0.24; p=0.006
Initiative	--	r=0.30; p=0.006	r=0.17; p=0.049
Task completion	--	--	r=0.18; p=0.034
Accountability	--	r=0.28; p=0.010	r=0.24; p=0.005
IT	--	--	--
Team work	r=0.27; p=0.014	r=0.33; p=0.002	r=0.21; p=0.015
Problem solving	--	r=0.24; p=0.029	--
Critical appraisal	--	--	--
Ethics and professionalism	--	--	--
Reflective practice and CPD	--	--	--
Professional competencies overall	--	r=0.41; p<0.0005	r=0.20; p=0.023

In the "Delivery of Patient Care Competencies" cluster a positive correlation was found between students' performance in the OSCE exam and the "communication with patients, carers and other healthcare professionals" competency in SA3. High results in students' performance in the OSCE exam were associated with high levels in students' communication competency. No other correlations were identified.

The above findings provide evidence of the construct validity of the PDF as one would expect that higher levels of self-assessed competence would be associated with better performance on exams. The PDF might also have raised their awareness of what is expected of them, hence supporting them in focusing their learning.

5.6.8.2 Fourth year exam results and the self-assessed competence

Fourth year MPharm students had their OSCE exam at the end of their third year, before SA1, hence correlations were explored between this and students' self-assessed level of competence in SA1. The other fourth year exams took place after SA3, and for this reason written exam results were only explored in relation to SA3.

Overall, higher results in the OSCE exam were associated with higher levels of students' self-assessed competence in the Professional competencies in SA1. Positive correlations were also found between the students' performance in the OSCE exam and three competencies encompassed in the "Professional Competencies" cluster in SA1 (Table 5.32).

Higher results in students' pharmacy practice exam were associated with higher levels of self-assessed time management competency in SA3. Interestingly, no other correlations were found between the exam results, and any of the competencies encompassed in the "Delivery of Patient Care Competencies" cluster.

Table 5.32 Correlations between "Professional Competencies" cluster and the fourth year exam results

"Professional Competencies" cluster	OSCE for MPharm4 and self-assessed competency in SA1	Pharmacy Practice for MPharm4 and self-assessed competency in SA3	Overall MPharm4 and the self-assessed competency in SA3
Time management	r=0.39; p=0.002	r=0.39; p=0.006	--
Prioritisation	--	--	--
Initiative	r=0.39; p=0.002	--	--
Task completion	r=0.27; p=0.034	--	--
Accountability	--	--	--
IT	--	--	--
Team work	--	--	--
Problem solving	--	--	--
Critical appraisal	--	--	--
Ethics and professionalism	--	--	--
Reflective practice and CPD	--	--	--
Professional competencies overall	r=0.029; p=0.025	--	--

5.6.8.3 Summary

A summary of the comparison between MPharm students' self-assessed competence and their objectively assessed performance is presented in Table 5.33.

Table 5.33 Summary of the findings related to the comparison MPharm students' self-assessed competence and their objectively assessed performance

- All correlations found between third year MPharm students' exam results and the PDF were positive indicating better performance in exams being associated with higher levels of students' self-assessed competency and implying students' better ability to self-assess their competence;
- For both third and fourth year MPharm students the majority of the correlations were found between their exam results and the "Professional Competencies" cluster;
- No correlations were found between fourth year MPharm students' exam results and the "Delivery of Patient Care Competencies" cluster;
- There were no negative correlations, implying that the self-assessed competency and the objectively assessed performance were not opposites of each other

5.6.9 Self-directed learning questionnaire

This section will explore differences found in students' self-directedness towards learning over the three assessments and relationships between their self-directedness towards learning and the self-assessed competency. MPharm students' self-assessed self-directedness towards learning increased from SA1 to SA3 (Table 5.34).

Table 5.34 Median and mean scores of MPharm students' self-directedness towards learning

	Median	Mean
SDL1	51.00	44.15
SDL2	54.00	53.89
SDL3	56.00	56.15

The item response data was checked for validity. The responses varied from strongly agree to strongly disagree for the 13 items. The frequency of responses of each item was reviewed. Any uniform responses from students across the scale were excluded from further analysis as they could be considered unreliable. In SA1 none of the items had low frequencies (<10%) at one end of the scale. In contrast, in SA2 and SA3 the responses were clustered towards the strongly agree end of the scale. However, change in students' self-directedness towards learning was expected over the three self-assessments as they were exposed to the PDF and the SDL more times. Thus, a factor analysis was not conducted as the SDL items had been validated previously. However, internal reliability and Cronbach's α was calculated for the 13-items encompassed in the SDL questionnaire (α=0.977). All items were retained in the scale and a summative score was calculated to be used in further analysis.

Students' self-directedness towards learning increased significantly from SA1 to SA2 ($p<0.0005$, $r=0.5$), as well as from SA2 to SA3 ($p<0.0005$, $r=0.5$). Thus, in SA3 students were significantly more self-directed than at the beginning of the academic year. This might indicate that students have learned what is expected of them or they might have actually become more self-directed (Table 5.35). These findings might suggest that students' self-directedness towards learning increased from SA1 to SA3. This might be due to the fact that students might have learned what is expected of them, or they might have changed or both of the above.

Table 5.35 Differences found over time in students' self-assessed self-directedness towards learning

	SA1 compared with SA2	**SA2 compared with SA3**	**SA1 compared with SA3**
SDL	SA1 < SA2 p<0.0005	SA2 < SA3 p<0.0005	SA1 < SA3 p<0.0005

5.6.9.1 The perceived self-directedness towards learning and demographics

This section explores relationships between students' self-directedness towards learning and the demographics. In SA1 and SA2 no differences were found between students born in different continents, whereas, in SA3 students who were born in Europe (Mdn=61) self-assessed themselves as being more self-directed in their learning (U=13.500; z=2.165; p=0.025) than those who were born outside Europe (Mdn=54). However, whilst these students were born in Europe they might have completed their education in their place of origin or elsewhere and vice versa. However, different educational traditions may influence students' self-directedness towards learning.

Students who completed the SDL and had any part time job during term time (Mdn in SA1=49.50; Mdn in SA2=56.50) perceived themselves as being more self-directed in their learning than those who did not one (Mdn in SA1=31.00; Mdn in SA2= 54.00) in SA1 (U=2849.500, z=2.078; p=0.038) and respectively SA2 (U=635.500; z=2.272; p=0.023). This indicates that a part time job during term time might support students in becoming more self-directed in their learning. Those students whose part time job during term time was healthcare related (Mdn=53.50) perceived they were more self-directed in their learning than those students whose job was not healthcare related (Mdn=30) in SA1 (U=287.500; z=2.405; p=0.016). However, the research team did not know about any jobs that students could have had between SA1 and SA2 and SA2 and SA3 as the questions about the part time jobs were only asked in the first assessment.

One might expect that those students who had a previous degree to have been more self-directed in their learning than those who did not have one. However, the opposite was observed in the present research; in the SA3 (U=17.00; z=2.088; p=0.037) those students who did not have a previous degree (Mdn=55.50) perceived they were more self-directed in their learning than those who did have a degree (Mdn=47.50).

Those students who completed all the three self-assessments had better exam results. If only those students who completed the three self-assessments were

taken into account in the analysis, the results would be skewed (Figure 5.8 to Figure 5.12; Table 5.36).Students who completed all three assessments may have been more conscientious and hence spent more time studying and performed better in the exams. It is also possible that because they were more self-directed they achieved better exam results. Students who had self-assessed their own competency higher had performed better in the exams so there might be a link between self-assessed competency, performance and self-directedness towards learning.

Table 5.36 Comparison between students who indicated their perceived self-directedness towards learning in all the three self-assessments

	Student completed all three assessments (Mdn)	Student DID NOT complete all three assessments (Mdn)	Differences between groups
Pharmacy Practice MPharm4	67.00	61.00	U=442.500; z=2.198; p=0.028
Overall exam results in MPharm4	69.00	65.00	U=392.500; z=2.769; p=0.006
Pharmacy Practice MPharm3	69.00	64.50	U=508.500; z=2.276; p=0.023
Overall exam results in MPharm3	62.55	59.30	U=2113.000; z=3.209; p=0.001
OSCE	67.00	62.00	U=2198.000; z=2.688; p=0.007

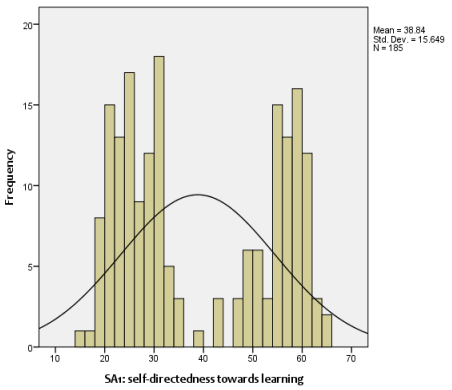

Figure 5.8 SA1: all students

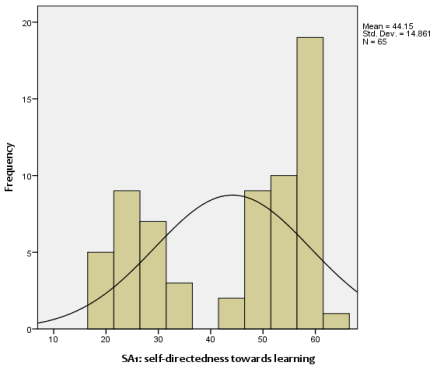

Figure 5.9 SA1: students who completed all three assessments

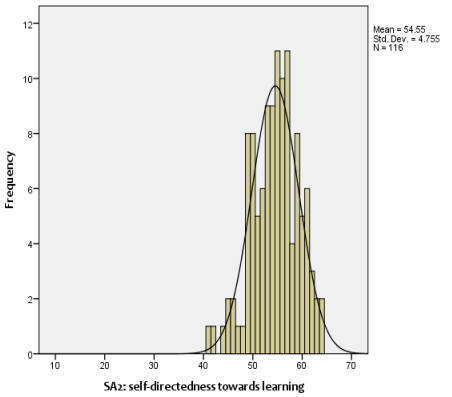

Figure 5.10 SA2: all students

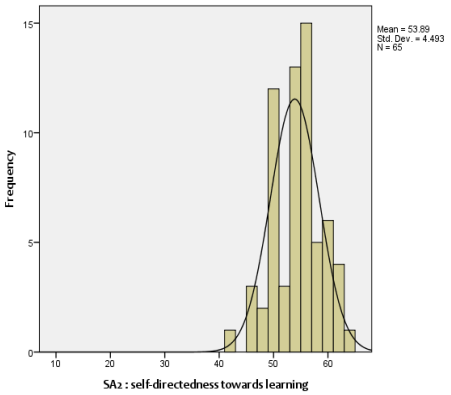

Figure 5.11 SA2: students who completed all three assessments

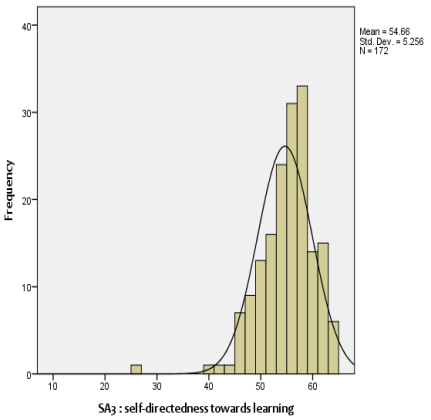

Figure 5.12 SA3: all students

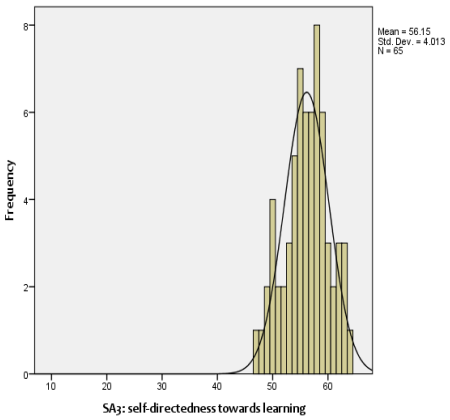

Figure 5.13 SA3: students who completed all three assessment

5.6.9.2 Self-rated self-directedness towards learning and the "Professional Competencies" cluster

This section presents a detailed description of the correlations found between the competencies encompassed in the "Professional Competencies" cluster and scores of students' self-directedness towards learning over the three self-assessments (Table 5.37). Positive correlations were found; a high level of competency was associated with a high level of self-directedness towards learning. Whilst in SA1 the self-directedness towards learning was positively correlated with three competencies, this number increased in SA2 to seven competencies and in SA3 this was observed for all of the competencies encompassed in this cluster. Overall, students with a high self-directedness towards learning were associated with high levels in their professional competencies. These findings might indicate that the more self-directed students are, the higher they rate themselves on the competency scale. This further supports the validity of the PDF in being able to capture perceived competence.

Table 5.37 Correlations between the self-directedness towards learning and the "Professional Competencies" cluster

"Professional Competencies" cluster	Overall SDL score in SA1	Overall SDL score in SA2	Overall SDL score in SA3
Time management	--	--	r=0.39; p<0.0005
Prioritisation	--	--	r=0.43; p<0.0005
Initiative	--	--	r=0.41; p<0.0005
Task completion	--	r=0.27; p=0.004	r=0.34; p<0.0005
Accountability	--	r=0.30; p=0.001	r=0.31; p<0.0005
IT	--	r=0.19; p=0.046	r=0.22; p=0.005
Team work	--	r=0.22; p=0.018	r=0.37; p<0.0005
Problem solving	r=0.15; p=0.035	r=0.40; p<0.0005	r=0.44; p<0.0005
Critical appraisal	r=0.20; p=0.006	r=0.33; p<0.0005	r=0.42; p<0.0005
Ethics and professionalism	r=0.16; p=0.031	--	r=0.21; p=0.007
Reflective practice and CPD	--	r=0.35; p<0.0005	r=0.52; p<0.0005
Professional competencies overall	--	--	r=0.53; p<0.0005

5.6.9.3 Self-rated self-directedness towards learning and the "Delivery of Patient Care Competencies" cluster

This section gives a description of the correlations found between the competencies encompassed in the "Delivery of Patient Care Competencies" cluster and the self-directedness towards learning over the three assessments (Table 5.38).

Positive correlations were identified, with higher ratings on the competency scale associated with high ratings on the self-directedness scale. This phenomenon was observed for five competencies in the first and second assessment and for all six competencies encompassed in this cluster in the third assessment. These findings indicate that the PDF shows students' development in the MPharm degree. Additionally it might also suggest that the self-directedness towards learning supports MPharm students in developing the competencies encompassed in the PDF as well as supporting them in the self-assessment process.

Table 5.38 Correlations between the self-directedness towards learning and the "Delivery of Patient Care Competencies" cluster

"Delivery of Patient Care Competencies" cluster	Overall SDL score in SA1	Overall SDL score in SA2	Overall SDL score in SA3
Health, illness and the patient	r=0.26; p=0.001	r=0.34; p<0.0005	r=0.35; p<0.0005
Drug specific issues	--	r=0.28; p=0.002	r=0.37; p<0.0005
Patient adherence and concordance	r=0.25; p=0.001	r=0.35; p<0.0005	r=0.29; p<0.0005
Selection of drug	r=0.24; p=0.001	r=0.26; p=0.005	r=0.47; p<0.0005
Provision of drug product	r=0.29; p<0.0005	--	r=0.34; p<0.0005
Communication	r=0.20; p=0.007	r=0.30; p=0.001	r=0.45; p<0.0005
Delivery of patient care competencies overall	r=0.24; p=0.001	r=0.34; p<0.0005	r=0.42; p<0.0005

5.6.9.4 Self-directedness towards learning and the objectively assessed performance

In SA1 no correlations were identified between students' self-directedness towards learning and their exam performance. However, positive correlations were identified in SA3 (r=0.25; p=0.005) between the students' self-directedness towards learning and their performance in the OSCE. Students who were more self-directed in their learning performed better in the OSCE exam, supporting the use of the PDF to enhance performance. No other correlations between students' self-directedness towards learning and other exam results were identified.

Whilst previous sections presented the quantitative results related to the evaluation of the use of the PDF, the following section presents the qualitative results related to this.

5.6.9.5 Summary

A summary of the findings related to the comparisons between students' self-reported self-directedness towards learning and their demographics, self-assessed competence in the two clusters, and the objectively assessed performance is presented in Table 5.39.

Table 5.39 Summary of the findings related to the comparisons between MPharm students' self-reported self-directedness towards learning and their demographics, self-assessed competence in the two clusters and the objectively assessed performance.

- There was a strong correlation between the self-directedness towards learning and students self-assessed competency;
- Students' self- directedness towards learning increased over the three assessments;
- The number of correlations between students' self-assessed level of competency and self-directedness towards learning increased over the three assessments; this further emphasises the validity of the PDF as a tool which supports learning;
- In the third self-assessment, students' high self-directedness towards learning was associated with high ratings on the competency scale in all the competencies encompassed in the PDF.

5.6.10 Stakeholders' views on the use of a PDF for MPharm students and how this could be implemented in pharmacy practice

As the PDF was tailored on a competency based approach it was felt to be sensible to explore pharmacy and pharmacy education stakeholders' views on a competency based approach and about the use of the PDF in the MPharm degree as well as recommendations of how it could be implemented efficiently in the future. Students' views about the use of the PDF were explored in university B after SA3.

5.6.10.1 Sample

Eight stakeholders participated in telephone interviews that explored, amongst others, their views on the PDF and the ways in which it could be implemented in the MPharm degree. Eighteen final year students participated in two focus groups.

5.6.10.2 Perceptions of competence/competency

Stakeholders interviewed agreed that a competency based approach for the development of MPharm students was important. Two of the main benefits of the PDF would be that it informs the development of MPharm students whilst simultaneously motivating them to engage with the process. One of the stakeholders perceived that a competency based approach has its place in the MPharm programmes as there is "nothing" to support MPharm students' development of competencies:

> *"I think [a PDF for MPharm students] has its place because I think there is nothing else".*
>
> *I7, p 9*

Some of the interviewees perceived that a competency based approach in the MPharm programme would help students to familiarise themselves with the self-assessment process, as in the future, when students become registered

pharmacists this will be a requirement and part of the CPD process. Stakeholders thought that the PDF would support students in the identification of their learning needs as well as helping them to familiarise themselves with the future requirements for pharmacists, thus, contributing to their development:

> *"Would it allow them to see where the gaps are? Yes. And would it allow them to perhaps [...] have a clear view of what their profession wants? Yes".*
>
> *I 8, p 23*

Two of the stakeholders perceived that grading competence is difficult as one usually either is or is not competent. The present research adopted the view that competence can be a graded process. However, one of the interviewees representing a community pharmacy multiple perceived that grading competence, in order to motivate students and not to tell them that they are not competent, was considered to be difficult:

> *"And you cannot grade competence. You know, I think it's really difficult to grade competence, so you can tell them they are making a satisfactory performance and they are on their way to being competent, but how do you grade it? How do you mark it?".*
>
> *I 7, p 31*

5.6.10.3 Perceptions of the use of the PDF

Showing students how the PDF would help them to become accustomed with the steps of the CPD cycle, such as collecting evidence and reflection, and other developmental tools which they might have to use once they become registered pharmacists, was considered important in order to motivate them to engage with the PDF (General Pharmaceutical Council, 2010b). Additionally, it was also thought that the process of reflection would include reflection on learning as well as reflection on ongoing changes in the profession, to ensure that they are up to date. Keeping up to date in terms of knowledge and skills is very important but it is also important to keep up to date with the development of methods and tools aimed to support professional development, such as competency frameworks:

> *"It's about thinking what's changed, the world moves on, and it's making sure you're up to date but also by using the latest techniques or the latest information and having competency frameworks helps you do that";*
>
> *I4, p 84*

It was suggested that the PDF would not only support MPharm students to collect evidence to prove that they are competent but it would also support them with their revalidation once they become registered pharmacists:

> *"I think the issue of revalidation from pharmacists and CPD will be based on a competency based process and many organisations are now using that".*
>
> *I 4, p 9*

Competency frameworks have been developed and validated to support pharmacists in their learning and development (section 1.3.4). A PDF was thought to support MPharm students to learn how to document and bring evidence to demonstrate their competence as well as supporting them to identify their own limitations. Students in focus groups who used the PDF in university B argued that collecting evidence of their competencies may be difficult for them unless they were guided to activities which they can perform in order to collect evidence to support their indicated level of competence in a particular area:

> *"It's really hard [to collect evidence because] you can't think of things yourself like unless we were given like certain activities and did them ourselves I wouldn't be able to think of how can I [collect evidence]."*
>
> *FG7, p 6*

This might indicate that whilst students require support in using the PDF and collecting evidence, they are also used to being given information and not to taking any initiative in their own learning, which they would have to do once they become registered pharmacists. If they had not practised self-directed learning beforehand, it would be difficult for them to engage with any requirements related to their own learning and development. However, in the present research, students' self-assessed self-directedness towards learning increased over the three self-assessments. Additionally, results indicated that students' high self-directedness towards learning was associated with high self-ratings on the competency scale.

Students who participated in the evaluation (FG7) perceived that it would not be enough for them to collect evidence from an activity performed once, but that they need to do an activity on a regular basis, in order to demonstrate that they are competent:

> *"If you're doing something you must be doing it on a regular basis to prove a competence".*
>
> *FG7, p8*

This may mean that students had understood that building competence was a process. Participants in FG7 perceived that the PDF provides support in identifying learning needs by encouraging reflection and judgement whilst also providing also feedback:

> *"The frameworks help to know where you're competent, so after reflecting on yourself you can probably judge where you might need some work or where you feel you're competent enough to do the job I guess, so the frameworks provide a good feedback."*
>
> *FG7, p9*

One of the interviewees perceived that employing a PDF in the MPharm degree would be a big challenge due to the different perceptions of professional development frameworks. It was considered important to integrate the PDF into the curriculum. It was suggested that the PDF could be encompassed in portfolios to support students in collecting evidence to demonstrate their competence whilst on placement but also whilst at the University:

> *"The other thing is that you should be able to use this sort of thing for placements and vacation work and all that sort of thing so that they could collect evidence."*
>
> *I 8, p 68*

It was also considered that by including the PDF in the curriculum students might see the usefulness of the PDF and would therefore, put more effort in completing it:

> *"If they're not actually going to be examined on something or it's not part of the course work requirements then they tend not to put a 100% effort in."*
>
> *I 5, p 58*

Students in FG7 believed that if the PDF was part of the curriculum, and the self-assessment of competencies using the PDF part of the assessment, there might be a problem with honesty as there might be a tendency to overestimation. On the other hand, the accuracy of the self-assessment process might be affected if the PDF was not part of the curriculum, as students would not place any importance on the PDF, as, regardless of their self-assessment, it would not have any direct influence on their degree:

> *"But if I know that somebody is checking it then obviously everyone will do little bit cheating or maybe varies. If nobody is assessing then obviously, you know, it's waste of time then, why are we doing that? When you're doing the course you have so much other coursework and so much other work to do that half the time, ok, you have to do it and people just tick something".*
>
> *FG7, p11*

Tutors could support MPharm students with self-assessing their competency by using the PDF, through discussing their self-assessment, whilst at the same time guiding them in developing their competencies. Without reviewing students' self-assessments, guidance and support the tool might not be effective:

> *"I suppose you know, it's really easy to set a framework up and have a list of standards within that framework that a student has to meet, but then if nobody actually reviews that work, or looks at that work and discusses where they are, one student can be turned off by the whole thing because they don't know if they are on the right pathway".*
>
> *I7, p 23*

Additionally students suggested that the PDF could be useful for tutorials. Participants in FG6 perceived that self-assessment of competence is difficult and subjective, thus, they suggested that support could be given to students by a member of the academic staff, experts in self-assessment of one's own competencies:

> *"I think it's subjective, you're subjective towards yourself so if somebody else is assessing you they'll see whether you're actually competent whereas if you were assessing yourself it's subjective you think you might know it but when it comes down to it you might not know it".*
>
> *FG6, p7*

It was considered that Involvement of student bodies and dissemination of information about the PDF with their help might have a great impact on students, thus encouraging them to use the PDF. It was thought that integrating the PDF in the curriculum and making it part of the assessment, would not only ensure an effective use of the tool but it would also encourage students to self-assess their competency by using the PDF:

> *"You may want to make it as part of the portfolio and they need to have that assessed before they move from one year to another that would be quite a heavy-handed way of doing it but that would motivate them"*
>
> *I5, p8*

The student participants in FG7 suggested that if the PDF could be completed over several sessions, it would allow students more time to think about it. This way the self-assessment might be more accurate and would also allow students to reflect:

> *"If it is in smaller stages you are more likely to think about it for more time and therefore your answers are probably going to be more accurate to how you feel rather than just trying to get it over and done with".*
>
> *FG7,p12*

Additionally, students perceived that the more often they self-assessed their competence, the more they would reflect on the behavioural indicators and their meaning as well as on their competence. As shown in section 5.6.6 students' self-assessed level of competence in the majority of the competencies encompassed in the PDF did increase over the academic year and correlated with performance indicating their ability in self-assessment. Nevertheless, allocating time in the MPharm students' timetable for completion of PDF would encourage students to engage with the process of reflection, self-assessment and self-directedness towards learning.

Whilst the development of a PDF for MPharm students was encouraged by both stakeholders and students in FG7, some issues related to PDFs in general were raised. Two of the interviewees, one pre-registration tutor and the representative of the NHS education and development department, perceived that there was a lack of consistency in the content and method of self-assessment of existing frameworks developed for pharmacists. They considered this causes confusion

amongst pharmacists, as different frameworks using different self-assessment methods were used at different levels of practice. Thus, it was suggested that existing and future frameworks should be linked, and they should use similar formats and self-assessment method, thus, pharmacists would be able to use them along throughout their career, instead of having to understand and become accustomed to different frameworks at different levels of practice:

> *"I think it should be done in a consistent and coherent manner so that it's consistent with other competency frameworks, cause my anxiety is that there already are pre-registration standards which will change in a short term, there is the pharmacy practice framework, which a pharmacist should be able to do in day one, there is the General Level Framework etc., and my concern is that if we have another framework which is not joined up to those there is potential for more, for confusion".*
>
> *I8, p 9*

A further area for more potential inconsistency was the lack of agreement in the definition of competence and competency and how this can be achieved as different frameworks might adopt different paradigms. The PDF for MPharm students was developed to employ the same paradigm as the GLF and the two have the same design and use the same rating scale. The effective use of the GLF has been demonstrated in primary care and community pharmacy (Mills *et al.*, 2005), and hospital pharmacy (Antoniou *et al.*, 2005).

Furthermore, the interviewee representing community pharmacy suggested that the PDF could be adapted to the different years of the MPharm degree. Participants in FG4 suggested that the PDF could be adapted to fit the different curricula by showing what is expected of students by the end of the different years of the MPharm degree or by allowing a chronological sequence of the behavioural indicators, competencies and clusters based on the order of modules and learning relating to these. It was further suggested that it could be students who could decide the chronological sequence, thus, the PDF would be less imposed and more flexible. Additionally, participants in FG4 suggested that in order to ensure efficient use of the PDF, it should be explained to MPharm students that the same behavioural indicators and competencies are applicable across the degree but at different levels.

Students supported the idea of introducing the PDF earlier in the MPharm degree. They thought that the PDF would help them to identify what is expected of them during the MPharm degree and also to indicate future requirements. Additionally, participants at FG6 and FG7 perceived that the PDF would provide support with better understanding the application of subjects in practice throughout the degree. Furthermore, students thought that the PDF would help them in planning their learning and development.

5.6.10.4 Perceptions of the rating scale

Students' views of the rating scale were explored in the focus groups with students who used the PDF. Participants in FG7 perceived that the rating scale was well defined but thought "usually" and "sometimes" options might be confusing for students. They suggested that the explanation attached to the rating scale was essential in order to help them in understanding the rating scale and to support them in distinguishing between the two options (usually and sometimes). The explanation of the rating scale was thought to clarify what is meant by the words used on the rating scale, which was perceived to be important in order to ensure that everyone understands the same thing:

> *"Keep like you know, the beginning, that actually, identifies what each thing actually means and that's really important because if you don't have that then everyone's meanings of the words would be different, whereas they actually tell you always actually means this so you actually know what it actually means".*
>
> *FG7, p14*

The "word scale" used was considered to be less familiar and time consuming, as students would have to refer back to where the explanation was. However, it was thought to be necessary as it encouraged thinking and increased the accuracy of the self-assessment process. In contrast, other students thought that the fact they would have to refer back to the explanation of the rating scale did not encourage them to use it. As suggested by participants at FG7 this problem could be addressed by making it clear to students that they would have to read the explanation of the rating scale before starting to complete the PDF, or by finding a way to include it in on every page of the PDF:

"Would it be better to have a small table at the top of each page so it is not always necessary to go back?"

FG7, p14

Whilst a numerical rating scale was perceived by the students to be better understood and more familiar to students, they also thought that it would not encourage thinking, thus, the completion of the PDF might become a tick box exercise rather than a tool to support the development of MPharm students.

Students suggested that a comment box may be added to the rating scale, so that students could indicate any misunderstanding or comments they would like to make related to any of the competencies or behavioural indicators encompassed in the PDF:

> *"I think it is described well what each one is maybe just to have a line for "other" say "if there is anything extra you want to add or if you don't feel you fit into one of those categories" and I think most people would but just in case maybe a line just to write your own thoughts".*
>
> *FG6, p9*

As described earlier in this section students perceived that the PDF would provide them with support in a number of different ways. In contrast, the only disadvantage that was identified was that the PDF takes time to complete. Their views about the behavioural indicators and the rating scale were mainly positive. They also perceived that some of the behavioural indicators were too complex. Whilst the word scale was not that familiar to students it was thought it was useful and needed, concise and easy to understand. Also they perceived the explanation attached to the words used in the rating scale helped them in understanding the meaning of the rating scale.

5.6.10.5 Summary

To conclude, explaining to students the link between the PDF and the future requirements, such as the requirements for the pre-registration year, was thought to contribute both to the efficient use of the PDF in the undergraduate level as well as to motivate students to engage with using the PDF. This might be done with the

help of tutors, if the PDF became part of the MPharm curriculum. At the same time support might be provided through student bodies, if there was to be a department which would be responsible for the professional development of MPharm students, similar to the RPS for pharmacists. If used constantly across the MPharm degree the PDF could indicate MPharm students' progression during their degree studies.

6 DISCUSSION

The key findings of the present research will be discussed in this chapter. These will be followed by discussing the methods used both to develop and evaluate the use of the PDF. The chapter will continue with the discussion of the findings related to the self-assessed self-directedness towards learning, the limitations and will end with recommendations for future use of the PDF.

6.1 Summary of the key findings

Overall, this research demonstrates the following:

- An iterative process was used to identify the competencies required of MPharm students to develop and design the PDF
- the PDF could be used by pharmacy students as a tool to self-assess their competencies
- MPharm students' self-assessed competence correlated with their performance in exams
- MPharm students' self-assessed level of competency increased in all except one competency over the three assessments
- MPharm students' self-directedness towards learning increased over the academic year
- MPharm students' self-directedness towards learning correlated with their performance in exams.

To summarise, in the whole student cohort MPharm students' self-assessed level of competency increased over the three assessments in six out of 11 competencies in the "Professional Competencies" cluster and in four out of six competencies in the "Delivery of Patient Care Competencies" cluster. These competencies were the following: time management; prioritisation; task completion; problem solving; critical appraisal and reflective practice and CPD in the "Professional Competencies" cluster and health, illness and the patient; drug specific issues; patient adherence and concordance; selection of drug product in the "Delivery of Patient Care Competencies" cluster.

Overall, students' self-assessed level of competency increased from SA1 to SA3, except in the competency related to accountability, in which students' self-assessed

level of competency was lower across the three assessments. The next section will discuss the methods used in this research.

6.2 Methods used in the present research

Evaluation of certain clinical competencies of pharmacy students has been reported in the literature(McG Harden et al. 1975; Monaghan, Vanderbush, & McKay 1995; Rutter 2001; Corbo et al. 2006). However, a tool aimed at assessing pharmacy students' competencies required during their degree, not only the outcome (i.e. ability to provide clinical care) but also the competencies required to achieve that, was not identified in the literature. Hence, the methodology used to develop the PDF was decided upon by the research team, using as an example at the onset of the research previously validated competency frameworks for pharmacists in the UK such as the GLF (McRobbie *et al.*, 2001) and the ACLF (Meadows *et al.*, 2004). In some cases competency-based learning outcomes that are based on competency-statements have been developed for pharmacy undergraduates (Purkerson *et al.*, 1996; Scott *et al.*, 2002). These outcomes support and guide the schools of pharmacy in the development and improvement of their respective curricula in order to ensure that their graduates and at the same time future pharmacists are appropriately educated in order to practice in different area of pharmacy. Burke et al. (2008) suggests that in order to ensure that "there will be an adequate supply of appropriately educated and skilled" pharmacists the core competencies required of them should be identified. However, it is not enough to identify these. Appropriate tools should be developed in order to support students' development of these competencies and supporting them in linking the theory to practice settings. The rigorous development of the PDF ensured that the competencies encompassed in it are those expected of pharmacy students, emphasising the content validity of the PDF.

A review of the student handbooks of different schools of pharmacy, the use of workshops, interviews and focus groups conducted with academics, pharmacy students and stakeholders in pharmacy and pharmacy education and a series of iterations of the PDF ensured the aforementioned rigorous development of the PDF. Whilst the researcher did not have previous experience of collecting data

through qualitative methods, training in conducting interviews and focus groups was acquired and support was also given by the research team in conducting these. Similarly to the present research, the development of other competency frameworks (McRobbie *et al.*, 2001; Mills *et al.*, 2005) and the development of competency-based learning outcomes (Draugalis *et al.*, 2002) and competencies (Merl *et al.*, 2000) have started with a review of the literature. Additionally experts in pharmacy were used in the present research as well as in the development of GLF (Antoniou et al.2005; Mills et al.2005) and ACLF (Meadows et al. 2004) to review the behavioural indicators and the competencies. Additionally, in this study, following the comments from the experts the research team met regularly in order to discuss these and decide the next steps. In contrast with the studies evaluating the use of the GLF and ACLF, where pharmacists were asked to use the GLF four times during a year (McRobbie et al., 2001) and ACLF once (Meadows et al. 2004) respectively, in the present research MPharm students were asked to self-assess their competencies three times during the academic year. In contrast with the other studies conducted with practising pharmacists, the MPharm students were not expected to set the desired level of performance nor was this decided by someone else. This might had made the self-assessment process even more difficult for MPharm students as they did not have standards against which to self-assess their competence.

Draugalis et al. (2002) describe the development of learning outcomes, based on competency statements, for the Doctor of Pharmacy curriculum. These outcomes encompassed competency statements grouped into five domains: patient care; dispensing medications and devices; health promotion and disease prevention; professionalism, and health systems management. Draugalis et al. (2002) reported the development of competency statements based on the literature of previously developed and publicised competency-based outcomes, and on the opinions of a committee formed of both members of staff and students. Similarly, in the development of the PDF students were involved in two workshops and two focus groups to ensure they understood, identified with and were able to use the competencies and behavioural indicators encompassed in it. Furthermore, one workshop, four focus groups and seven individual interviews with academics from different areas of pharmacy and other stakeholders in pharmacy and pharmacy

education ensured that the identified competencies and behavioural indicators encompassed in the PDF would be relevant and appropriate to pharmacy students. Thus, both students and academic members of staff in different schools of pharmacy were involved all along in the development of the PDF.

In a study about the identification of competencies for students at a medical school a mixed methods approach was adopted (Merl *et al.*, 2000). Four steps (preparation of materials, communicating with academic staff and students, evaluating feedback and formulating the competencies) were employed in two rounds, after which the competencies were agreed upon. After initial identification of the competencies (preparation of materials) these were sent out to stakeholders, students and academic staff for feedback (communicating with academic staff and students), which was collected through questionnaires, interviews, meetings and through two newsletters, in which updates about the developments were circulated. Once received, the feedback was evaluated and then competencies formulated. In the present research the development of the PDF involved qualitative methods whilst for the evaluation of its use both qualitative and quantitative methods were employed. The face and content validity of the PDF was ensured by a series of five sets of iterations, based on the opinions of students, academics and stakeholders' as well as based on the insight of the research team. Different methods have been adopted in the development of similar tools as the PDF. However, the methods used in the present research ensured a well-rounded and robust approach.

6.3 Development of the PDF

The PDF was developed in order to support students in identifying any gaps in their knowledge and skills, thus, the behavioural indicators have been phrased in a way which shows students the link between theory and practice.

Jesson et al. (2006) explored UK pharmacy students' attitudes to the practice and science debate and reported that students tend to understand the relevance of certain subjects only towards the end of their degree. Jesson et al. (2006) reported that pharmacy students did not even see the point of learning some other subjects at all. They did not understand how they could or would apply their knowledge.

Students indicated that they needed more explanation regarding the place of different subjects in the whole degree as well as the application of knowledge into practice. In this study, the stakeholders in pharmacy and pharmacy education suggested that known expectations on learning might support students in their development. This suggests that explicitly explaining to students from the very beginning of their degree the relevance of the different subject areas to their future career as well as the place of different subject areas in the whole degree and how would they apply the knowledge in a practice setting might support students in their development. The competency based learning outcomes might not succeed in this, even though it was suggested that they would support students in monitoring the development of their competencies, as students might not recognise the underlying knowledge needed to perform certain tasks (Draugalis *et al.*, 2002). Furthermore, Jesson et al. (2006) reported that students need support in understanding the link between the knowledge and its applicability in practice. Indeed Waterfield (2010), suggested that schools of pharmacy should ensure that the pharmacy students are able to apply and integrate their knowledge in practice settings. The above mentioned issues suggest that there seems to be a discrepancy between the assumptions stakeholders in general have made about students' understanding of underpinning knowledge required for effective performance at the undergraduate level and what students think. The behavioural indicators encompassed in the PDF were phrased in collaboration with students, in such a way that indicates to students the application of the subject areas learnt during their undergraduate degree in practice. Additionally, the content and face validity of the PDF were also ensured by the literature review which supported the early identification of competencies and behavioural indicators.

The PDF was modelled on existing competency frameworks developed for junior, general (McRobbie *et al.*, 2001; Mills *et al.*, 2004; Mills *et al.*, 2005), or advanced level (Meadows *et al.*, 2004): closely related behavioural indicators were grouped under a competency and closely related competencies were grouped under clusters. A four point Likert scale, ranging from always, usually, sometimes and never, was used in the self-assessment of competency of general level pharmacists and was used in pharmacy students' self-assessment of their competency. Students who took part in the evaluation of the use of the PDF perceived that the rating scale encouraged

thinking which might have increased the accuracy of the self-assessment. The fact that the meaning of the items used in the rating scale was explained by mapping it onto Miller's pyramid (Miller, 1990) was considered essential by students in order to ensure all the students understood what is meant by the items in the scale. Indeed Rethans et al. (2002) suggested that Miller's pyramid is useful and efficient in developing educational programmes, in particular the ones which require initial acquisition of knowledge with progress to development of clinical skills. Studies which reported the mapping of the explanation of Likert scale on the Miller's pyramid had not been identified in the literature. However, this was done in the present study to support students in understanding the rating scale.

Having similar tools in content, structure and rating scale used to support the self-assessment of competency amongst pharmacy students and practitioners was thought to be important by the stakeholders in pharmacy and pharmacy education. The content of the PDF was mapped onto the indicative syllabus, which at the time guided the development of pharmacy curricula in the UK, onto the pre-registration standards, which guide the development of pharmacy graduates' competencies in the pre-registration year, as well as onto the GLF, a validated tool which support general level pharmacists' development of their competencies (Antoniou *et al.*, 2005; Goldsmith *et al.*, 2003; Mills *et al.*, 2005; Royal Pharmaceutical Society of Great Britain, 2002, 2008b). This mapping contributes to ensuring the face and content validity of the PDF. The GPhC has developed new education standards for the MPharm degree since the research was undertaken (General Pharmaceutical Council, 2011a). Whilst these new education standards adopt a competency-based approach, they do not comprise behavioural indicators or a rating scale. They describe the outcomes of the MPharm degree. Thus, they are designed with a focus on the learning outcomes the schools of pharmacy should ensure their students achieve upon graduation rather than supporting the development of the equivalent competencies of pharmacy students during their studies. However, similar to the scale used in this study for students' self-assessment of their competency using the PDF, the new educational standards have been mapped onto the Miller's pyramid to show the expected level of competency

As the GLF was developed for pharmacists (McRobbie *et al.*, 2001; Mills *et al.*, 2004), its content was developed to reflect the higher level of competencies expected of pharmacists compared to what is expected of undergraduate students. This difference was taken into consideration when developing the PDF and mapping the progression of expected competencies. The GLF has used the same rating scale, encompassed similar competencies but at a different level, thus addressing the problem of continuity of competency-based assessment tools. The GLF comprises four clusters (delivery of patient care, personal, problem solving and management and organisation competencies) (Mills *et al.*, 2005) whereas there are two in the PDF (professional and delivery of patient care competencies clusters). The number of clusters also suggests more is required of pharmacy practitioners than of students.

6.3.1 Evidence for the validity of the PDF

This section discusses the results of the evaluation phase in the light of other literature as well as the implications of the findings for practice. Whilst the development of a PDF for MPharm students has not been reported in the literature, the assessment of some of the competencies encompassed in the PDF has been reported and was compared with MPharm students' self-assessed level of competence in the present research (Pales *et al.*, 2008; Scott *et al.*, 2002; Austin, 2004; Corbo *et al.*, 2006). Additionally, reports on the development of learning outcomes for pharmacy (Scott *et al.*, 2002) and medicine (Pales *et al.*, 2008) degrees have also been identified in the literature. While the evaluation of developed learning outcomes mentioned before was based on students' self-assessed level of competency, the aim of self-assessment was to aid the development of curricula rather than support the development of a tool that could help students in their development.

In this research, it was found that the PDF shows MPharm students' development of their competencies both within the third and fourth years of study as well as from the third to the fourth year of study (i.e. the students' self-assessed competence increased over time). Whilst pharmacy students self-assessed their competencies using a four point Likert scale (always=4, usually=3, sometimes=2,

never=1), competency and cluster scores were formed as overall medians. Already in SA1, in the "Professional Competencies" cluster, median scores for the 11 competencies were above 3 (usually), and for the "ethics and professionalism" and "accountability" competencies the median score was 4 (always). Thus, this indicated that students perceived that they "knew how", as suggested by Miller (1990) (median ≥ 3) or were able to "show how" (median=4), to demonstrate their competence in this cluster. Thus, there was little room for improvement in the competencies for which the medians were 3. On the other hand, in SA1 in the "Delivery of Patient Care Competencies" cluster the whole cohort of MPharm students, self-assessed median competency was only 2 (sometimes) in two of the six competencies, indicating that the students perceived that they "knew" some things about the competencies, but they had rarely demonstrated their ability. On the other hand, for four of the six competencies the self-assessed level of competence was three (usually), which suggested that the students perceived that they "knew how", and also that they had demonstrated that ability with rare lapses but they would have to improve their competency by practising it more often. Thus, there was more room for improvement over the year, particularly for the third year students. These and other differences are discussed in the next sections.

6.3.1.1 "Professional Competencies" cluster

Research on medical students by Whittle and Murdoch Eaton (2001) reported awareness of the importance of transferable skills in medicine. "Transferable skills" is the term used by the author to describe the equivalent of the generic competencies referred to as professional competencies in the PDF. This suggests that both pharmacy and medicine undergraduate students are aware of the importance of transferable competencies for their future careers, while they may not be certain about the knowledge they are expected to learn during their degree.

Students' self-assessed level of competence was expected to increase over the year. This was confirmed by the findings of this research which indicated that in the whole cohort students' self-assessed level of competence increased from the first to the second assessment, but it decreased from the second to the third assessment. However, across the three assessments students' self-assessed level of

competence was at least 3. Medical students have been reported to have self-assessed their transferable skills on a four point Likert scale ranging from one (low) to four (high) : students scored >2.5 in all categories (information handling, technical skills, IT skills, organisational skills, self-learning skills, presentation skills) (Whittle and Murdoch Eaton, 2001). It was thought that the medical students might have overestimated their own transferable skills as they did not have experience of self-assessment. However, in this study the positive correlations found between students' self-assessed level of competence and their exam results indicate that students did not overestimate their competencies but they might still lack the ability to self-assess. A greater emphasis on learning how to self-assess one's own skills in the pharmacy degree might be required to ensure that students are able to assess their own strengths and weaknesses. This is of great importance as students are expected to take responsibility for their own learning and development once they become registered pharmacists (General Pharmaceutical Council, 2010b).

No differences were identified between the self-assessed level of competence of male and female students in the overall median in the "Professional Competencies" cluster. In contrast, Whittle and Murdoch Eaton (2001) reported that male medical students reported their transferable skills to be higher than female students. Furthermore, Whittle and Murdoch Eaton (2001) reported the same effect for the IT skills. However, in this study, differences were identified in the "ethics and professionalism competency", where male students self-assessed their competency higher than female students in SA1 and SA3 which might indicate that male students might be more professional and ethical than female students, or that they were more confident in self-assessment. The same trend was observed in the "ethics and professionalism" competency within the fourth year student group. In contrast, male students in the third year student group self-assessed their competency related to "team work" lower than female students. Thus, these findings suggest that female students integrate better in a team than male students. For the competency related to "critical appraisal" male students self-assessed their competence higher than female students within the third year student cohort. However, in the study by (Pales *et al.*, 2008), no significant differences were found between these groups and competencies.

Pales et al. (2008) reported that final year medical students perceived that they lacked knowledge in relation to searching for information. In contrast, in this study, in all three assessments, final year pharmacy students perceived that they "knew how" (usually) to search for information and could critically appraise it. In addition, their perceived level of competency also improved across the three assessments.

6.3.1.2 "Delivery of Patient Care Competencies" cluster

The "Delivery of Patient Care Competencies" cluster in the PDF encompassed, amongst others, competencies related to students' clinical, practical and health promotion competencies, which were also explored amongst medical students (Pales *et al.*, 2008). Final year medical students were asked to self-assess their competence two weeks prior to graduation and these results will be compared with final year MPharm students' self-assessment of their competence. In this study, fourth year MPharm students' self-assessed level of competence in the items encompassed in this cluster was three (usually), indicating an ability to perform with occasional lapses and the need to improve by practising the competencies more often. The students will have this opportunity during the pre-registration year. Pales et al. (2008) reported that final year medical students self-assessed their level of competence in the areas mentioned above at level three, indicating an adequate level of competence, but perhaps lower level than pharmacy students as their competency was assessed on a five-point scale. Unlike MPharm students, medical students had had their final exams, thus, they might had been more aware of their competencies.

Final year pharmacy students' self-assessed median score in the competency related to patient investigation and application of their knowledge to practice settings was three (usually) from the first assessment and their median score in their self-assessed competence related to communication was four (always). Pales et al. (2008) reported similar findings: fourth year medical students' self-assessed level of competence relating to patient investigation and application of their knowledge to practice settings and communication were perceived as adequate and that they are able to perform these competencies. Pharmacy students' perceived level of competence related to communication improved from the third to the fourth year.

Scott et al. (2002), reported that pharmacy students' self-assessed level of competence related to communication increased from their first to third year of their studies. Students were achieving the desired level: the median score of third year pharmacy students' self-assessed level of competence was three (usually) in all three assessments and four for fourth year students. The above indicate that "competence" is a continuum, it is not something that ends with the end of the pharmacy degree, our development continues throughout our careers, at different levels. Similarly, Scott et al. (2002) reported that the third year pharmacy students' mean self-assessed competence score related to communication was above four out of a maximum of five.

Scott et al. (2002) reported that as expected pharmacy students' self-assessed level of competency related to the "pharmaceutical care" competency increased from their first to their third year of their pharmacy degree. The "pharmaceutical care" competency encompassed descriptors, which, in this research were in the "delivery of patient care" cluster. Indeed, in this study, the median of the third year pharmacy students' self-assessed competence was above two in the first two assessments and reached three in the third assessment whereas for fourth year students it was three from the first to the third assessment indicating an ability to perform with occasional lapses and the need to improve by practising it more often. Similarly, Scott et al.(2002) reported that the mean for third year students' self-assessed level of competency in this area was almost four, out of a maximum of five.

The competency based learning outcomes developed for the Doctor of Pharmacy degree at the University of Arizona, encompassed five domains: patient care, dispensing medications and devices, health promotion and disease prevention, health systems management (Draugalis *et al.*, 2002). These outcomes were expected of "entry level generalist pharmacists". On the other hand, it was suggested that students did not "perform at an acceptable level" in any of the competencies. However, the students should be able to perform at "a specified level at graduation". This leads one to ask: what is the expected level? Where should this be set? How would students achieve that level? What support do they need? The aim of the pharmacy degree should be to ensure that students reach a competency level where it is considered they can practise safely, and to ensure the

safety of the patients. By the end of their degree MPharm students should be expected to achieve the "know how" level of the Miller's pyramid in all competencies encompassed in the PDF and during their pre-registration year they would have the chance to apply their knowledge in a patient facing environment. Thus, they would have the opportunity to reach the "show how" level of the Miller's pyramid. Self-directedness towards learning is an ability that is developed in time and not an ability that is inherited once one becomes registered with the GPhC. This requires changes to the teaching and assessment methods during the undergraduate degree as well as the development of tools, such as the PDF for the undergraduate level and the GLF and ACLF for the general and advanced pharmacists, to support future and current pharmacists in becoming independent, self-directed learners. Currently the GPhC has adopted a competency-based approach in the development of the new standards for the MPharm degree (General Pharmaceutical Council, 2011a). These are seemingly based on the Miller's pyramid. Additionally, these indicate the expected levels of competence at the end of the MPharm degree and at the end of the pre-registration year. However, how the students are expected to reach these levels is not mentioned. Support should be given by the schools of pharmacy to students to ensure that they reach the required level. Assessing students in their knowledge and clinical skills might not be enough. Support should be given to students in self-assessing their own performance in order to identify possible gaps in their knowledge and help them in identifying ways in which these gaps could be addressed.

In terms of response, the majority of the respondents were female students, which is a reflection of the female:male ratio in UK registered pharmacists. In contrast to the "Professional Competencies" cluster, differences were found between female and male students in their self-assessed level of competencies. In "drug specific issues" and "health illness and the patient" competencies in the first assessment male students self-assessed their competence as higher than female students in the whole cohort and in both third and fourth year MPharm students groups which might indicate the male students think they are better than female students in taking drug histories and finding any relevant information from the patient.

Scott et al. (2002) reported that pharmacy students' self-assessed communication skills improved from their third to their fourth year which was confirmed also in the present research. However, Scott et al. (2002) used the findings to inform the development of competency-based educational outcomes for curriculum development whilst in this research the PDF was designed to support students in self-assessing their competence. Whilst the educational outcomes should indicate the competencies expected of students at the end of their degree, the curriculum should support students in understanding and in the development of these competencies.

6.3.1.3 Self-assessed competence and performance

Now moving to performance, the OSCE at University A assessed students' abilities related to numeracy through dose calculation; clinical decision making through most exercises; doctor communication through discussing interactions and adverse drug reactions related to prescribed drugs; patient communication through responding to symptoms exercises, counselling on the use of a new drug; and a checking exercise. As most aspects assessed in the OSCE related to communication competency, correlations between the two were expected. The positive correlations found between third year pharmacy students' self-assessed competence in "communication with patients, carers and other healthcare professionals" and the OSCE exam indicate that students were able to self-assess their competence, suggesting that the PDF can be used as a reliable tool in students' self-assessment of their competencies. In contrast, in a study which explored the accuracy of pharmacy students' self-assessment skills students tended to overestimate their communication competencies, which included empathy, focus, logic and coherence of interview, even if their actual performance was poor (Austin and Gregory, 2007). In this research, the better the students became in their performance the more they underestimated their level of competence. On the other hand, Laaksonen et al. (2007) found that the more competent community pharmacists were, the more they thought that they were not as competent as those who performed poorly in providing medication reviews. Ried et al. (2002) also reported that pharmacy students tend to overestimate the self-assessed level of the competencies related to the provision of pharmaceutical care. Ried et al. (2002)

suggested that exposure to practice during their undergraduate degree might give students the opportunity to get a real sense of their level of competence whilst helping them to developing their competences. Indeed, in this research, the stakeholders in pharmacy and pharmacy education suggested that more practice is required in the MPharm degree in order to ensure the competence of MPharm students at graduation and therefore, a safe environment for the patient.

Additionally, in this research, a positive correlation was found between the OSCE performance and students' self-assessed "team work" competency for third year MPharm students whereas, for fourth year MPharm students such correlations were observed in students' "time management", "initiative" and "task completion" competencies. However, all, except the "team work" competency, were required in the OSCE. The reliability of students' self-assed competence was further explored, in this study unlike in others, by comparing this with students' pharmacy practice and overall exam results in their respective year of study. Whilst positive correlations were found between third year pharmacy students' self-assessment in the following competencies encompassed in the "Professional Competencies" cluster: "time management", "prioritisation", "initiative", "accountability", "team work" and "problem solving", and the pharmacy practice exam, for fourth year students this was the case only for the "time management" competency. For third year MPharm students positive correlations were also identified between their self-assessments' in the following professional competencies: "time management", "prioritisation", "initiative", "task completion", "accountability", "team work" and the overall exam results in their third year. In contrast, for fourth year MPharm students no correlations between their self-assessments and the overall exam results were identified. It is, however, worth noting that negative correlations were not observed. This suggests that the PDF is a useful tool that can be used by pharmacy students to self-assess their competence.

Antoniou et al. (2005) investigated the role of competency frameworks in supporting learning and found that pharmacists who used the GLF developed faster than those who did not use it. The pharmacists who used the GLF and had the support from their mentors improved their performance in 24 of the 25 competencies six months after they started to use the GLF, and the level was

sustained 12 months later. A similar phenomena has been found in a study with primary care and community pharmacists (Mills *et al.*, 2008). Pharmacists who did not use the GLF were assessed by external tutors, using the GLF, and demonstrated an improvement in seven of the 25 competencies by six months and in 12 of the competencies by month 12 (Antoniou *et al.*, 2005). In the present study, due to limitations in resources a similar study design, where a cohort of participants did not use the PDF, was not possible. However, different approaches were taken in evaluating the use of the PDF: in one school of pharmacy completing the PDF was compulsory, whereas in the other its use was not part of the curriculum. However, the results indicated that the PDF demonstrated students improvement in many competencies encompassed in the PDF, despite the different approaches in the schools, which supports the validity and the reliability of the tool. Additionally, students who completed all the three assessments achieved better median results in the OSCE and exams than those who completed the self-assessment only once or twice. While this group of students might have been inherently better whether or not they used the PDF, this finding gives an indication that the PDF might support the students learning and competency development.

Changes in the students' self-assessed level of competence were expected for both third and fourth year MPharm students. This change was observed in both clusters (professional and delivery of patient care competencies), indicating the construct validity of the tool. The progression in the self-assessed level of competence was also observed by Ried et al. (2002) and Scott et al. (2010) in two studies which explored pharmacy students' self-assessment of the attainment of the competencies delivered by the curriculum relating to pharmaceutical care competencies. Thus, these findings suggest that students perceived an increased level of attainment of competencies related to pharmaceutical care across the degree.

It is expected that MPharm students show progress in their learning during their undergraduate degree. Similarly to the GLF, which detected improvement in the competencies for hospital and community pharmacists (Antoniou *et al.*, 2005), the PDF showed the progress in students' self-assessed level of competence within and across the years, supporting the construct validity of the tool.

Since the engagement in CPD has become a requirement for pharmacists in order to maintain their competency and registration, the potential difficulty of self-assessment might become an important issue. Pharmacists who had performed better in providing medication reviews self-assessed their competence lower than those who had performed poorly which might suggest that pharmacists might need support in how to self-assess (Laaksonen *et al.*, 2007). Indeed, Austin and Gregory (2007) reported that self-assessment is not a "naturally occurring nor easily demonstrated skill". Furthermore, pharmacists, who were involved in a study which explored their attitudes, behaviours and preferences towards continuing professional development, reported difficulties in self-appraisal and identification of learning needs (Austin *et al.*, 2005). This suggests that if pharmacists face difficulties in self-assessing their competence this might be the case as well for MPharm students. Whilst the self-assessment of competency and identification of learning needs is a requirement in the UK as soon as pharmacy students become registered pharmacists there is not much emphasis on this at the undergraduate level. Thus, it may be that this is something that they are not always explicitly taught and rarely practise during their MPharm degree. Dyke et al. (2009) explored amongst other issues first year MPharm students' perceptions about becoming independent learners. They found that students had doubts about self-evaluation, and perceived that an evaluation of their learning needs should be done by someone else and not by themselves. This suggests a need for guidance and support within the MPharm degree in order to ensure that pharmacy students are able to self-assess their own performance which in turn would support them in identifying their own learning needs and later on in engaging with CPD. In this study, the stakeholders in pharmacy and pharmacy education perceived that for the PDF to be used efficiently within the MPharm degree, students would need support in using it, that is, in discussing their self-assessment whilst at the same time being guided in the development of competencies.

It is possible that MPharm students' confidence in their competence could influence their self-assessment of their competence. Those who are confident might overestimate their self-assessment whereas those who are less confident, even though they might perform better, might underestimate their self-assessment

(Laaksonen *et al.*, 2007). Indeed, Valdez et al. (2006) explored second year pharmacy students' perceived level of confidence and their performance in a knowledge assessment test. The students' perceived level of confidence did not reflect their performance in the knowledge assessment test: those who were less confident gave the same amount of correct answers as the ones who were confident. It is necessary to explore the potential influence of confidence in one's own knowledge and skills on self-assessed competence and actual performance.

6.3.2 Self-directed learning

As part of the evaluation of the use of the PDF, students' self-directedness towards learning was also explored. The emphasis on self-directedness towards learning has increased in the last couple of years with the introduction of mandatory CPD (General Pharmaceutical Council, 2010b). Participation in CPD and attaining and maintaining competence can be supported by the use of competency frameworks.

Students' perceived self-directedness towards learning increased from the first to the third assessment. This finding was also reported in a study that explored first year MPharm students' perceptions about self-directed learning in a problem-based learning course (Ryan, 1993). The mean scores of MPharm students' self-directedness towards learning increased from the first to the last assessment. However, these students were registered nurses who were upgrading their certificates and who had experience of at least two years in professional practice, whereas the students in the present study did not have the experience of professional practice. Students might have also learned what is expected of them and therefore gave the answers they thought were expected of them and not the ones that indicate their real level. In the present research, in order to minimise the impact of Hawthorne effect, data from students who gave a constant response across the self-directed learning questionnaire, were excluded from the analysis.

6.4 Limitations

Final year students in two schools of pharmacy and third year students in another were recruited from three schools of pharmacy in southern England to participate in the evaluation of the use of the PDF. In each of the schools a different approach was adopted in order to administer the PDF document: for final year students in one of the schools the self-assessment of their competencies using the PDF was compulsory, whilst in another the self-assessment was not compulsory but the students had the experience of OSCEs and placements, and in the third school the self-assessment using the PDF was not compulsory but the students had the OSCE experience. Whilst in two of the schools students engaged with using the PDF, in the third response rates were low after the first assessment and the school withdrew from the study. The contact person in this school was not actively involved in the research project and had recently started in a new position, thus, the students might not have had the time to become acquainted with the person as an academic member of staff. It is difficult to ensure that people recruited for research will provide continued support to the project. However, various methods, such as email and telephone reminders were used to try and ensure the smooth running of the project at each site and increase response rates. First and second year students were not recruited in the study, thus no data on their development were obtained. However, third and fourth year students were recruited in the study. They had completed most of the degree and their self-assessments were linked with the OSCEs. Additionally, the data was collected in two schools of pharmacy, thus, the findings are not necessarily generalizable.

The overall response rate declined from SA1 to SA2 but increased again in SA3. The decrease in the response rate in SA2 might be due to the fact that students received only an email reminder about completing the self-assessment whereas before SA1, the PDF was introduced to students as part of common lectures in three universities. In an attempt to increase the response rate students in both remaining universities were allocated a time within the course for completing the assessment. This resulted in an increase in the response rate in the third assessment which might indicate that the PDF should be part of the curriculum for students to make the most of it, as suggested by the stakeholders in pharmacy and pharmacy education.

Fourth year students at University B who participated in a focus group were self-selected. An incentive was given at the end of the focus group but this was not known when the students volunteered to take part.

One of the limitations of the PDF is that it has been developed to address the competencies required of UK pharmacy students. However, in the development of the PDF international academics and other stakeholders and pharmacy students from other countries were involved in the identification of relevant competencies. Thus, with modifications, the PDF could be used in other countries. In any case, pharmacists should be able to practise safely wherever and whenever they have qualified. Indeed, the GLF, although developed for the UK practice, has been adapted to be used in Australia (Mariott *et al.*, 2008), Croatia (Mestrovic *et al.*, 2011), Singapore and Serbia (Competency Development and Evaluation Group, 2011).

Due to the time constraints in the study students did not receive any feedback on their self-assessment. A lack of feedback from the academic members of staff has been reported to have had a negative effect on students' confidence, which might affect students' perceptions of their level of competence (Jesson *et al.*, 2006). However, the positive correlations found between students' self-assessed level of competence and their exam results indicate that, in most cases, students were able to self-assess their competence and that the PDF is a valid and reliable tool. If students would have received feedback the relationship between competence and performance may have been even greater.

6.5 Recommendations for future use and further work

The PDF could be used in a number of different ways. It could be mapped onto the curriculum of a school of pharmacy to identify competencies that are not being met by the curriculum as well as competencies which might have not been included in the PDF (Scott *et al.*, 2002). Although a rigorous iterative process was completed in the process of development of the PDF, further development is needed as the roles of pharmacists change. The PDF could be used as a tool to assess the learning outcomes of the schools of pharmacy in the UK (Scott *et al.*, 2002). In the US, schools of pharmacy use students' self-assessment of their competencies to ensure

the assessment, evaluation and improvement of curricular outcomes (Ried *et al.*, 2002). Additionally, the PDF could be used to evaluate the use of different teaching and assessment methods: do they meet the students' learning needs and competencies that are expected to be developed?

Expected levels of competency at the end of each academic year could be decided upon in schools of pharmacy. These levels would be different in different schools of pharmacy depending on their curriculum but in the final year expected levels of competency should be universal. Students' self-assessment of their competencies could be supported by tutors' help and assessment (Austin *et al.*, 2004). In the cases where positive correlations are identified between students' self-assessments and tutors' assessments, students could be directed to continue using the PDF. The use of the PDF could be augmented by instructing the students to collect supporting evidence and by tutors providing feedback to students on their self-assessments and the supporting evidence collected. In those cases where students' self-assessments of their competency do not correlate with tutors' assessment, they could be guided to seek support by meeting with tutors to discuss how to address their gaps, plan how to do this and ensure they achieve the required standards of competency (Austin *et al.*, 2004). This way the PDF would not only support students' learning but it would help the development of their self-assessment skills/insight.

The interviewed pre-registration tutors perceived that some of the behavioural indicators encompassed in the PDF were at too high a level for MPharm students, and that in order for students to learn to self- assess, more opportunities in practice settings would be required in the MPharm degree. This idea was also endorsed by the Medical Education England (2011) which suggests that a five year integrated programme would allow for more exposure to practice for MPharm students which would support them in the development of both the knowledge and the competencies required for ensuring patient safety. However, the representative of pharmacy education policy perceived that some of the suggested competencies encompassed in the PDF were of a low level for the undergraduate degree and that more should be expected of them. This might indicate that there is a gap between policy makers and the pre-registration tutors who have regular contact with pre-

registration students. The possible transition to a five year integrated programme was taken into account in the development of the PDF by mapping it onto the pre-registration competencies. In the new educational standards the GPhC indicated using Miller's pyramid to show the level of competency expected of the MPharm students by the end of their fourth year and also by the end of their pre-registration year (General Pharmaceutical Council, 2011a). This way the four point Likert scale used in the PDF could be expanded to a five point Likert scale, and help students to link the science to requirements in the practice settings.

Hanning et al.(2002) suggested that increasing the time students spend with patients during their MPharm degree would enhance students' development of their competencies whilst ensuring at the same time that students are prepared to face the ongoing changes in the provision of healthcare services. Indeed, early patient contact had a positive impact on medical students' competence (Briggs-Style *et al.*, 1990). Furthermore, increased opportunities for pharmacy students to provide direct patient care is thought to support students to reflect on their knowledge and evaluate the effectiveness of their performance (Droege, 2003).

Dyke et al.(2009) reported that students did not engage in self-assessment as part of their personal development planning portfolios. If the PDF is introduced to MPharm students in the first year of the MPharm degree, it should not be introduced as the complete package. It may be better to introduce them just to the "Professional Competencies" cluster or some of the competencies encompassed in this cluster. Then the students would better engage with the process and new competencies could be introduced to them as they become relevant.

The administration of several assessments, to monitor progress at regular intervals during the degree, combined with feedback given to students might ensure not only the identification of strengths and weaknesses but would also encourage the identification of measures that could be taken to ensure that weaknesses do not become obstacles in any future learning activities (Szilagyi, 2009). Indeed, stakeholders suggested that students could be allowed to complete the PDF over three occasions. This would give students more time to think and reflect, enhancing at the same time the accuracy of the self-assessment process. Support from tutors

has been reported to help students in the identification of their learning needs as well as in identifying relevant resources to meet them (Ryan, 1993; Antoniou *et al.*, 2005). Indeed, in this research fourth year pharmacy students suggested that the support of tutors is needed in the self-assessment process.

The importance of students receiving support from tutors in the self-assessment of their competencies was emphasised on several occasions. However, training and support should be also provided for tutors. At a medical school in Canada, even though the academic members of staff were competent in the competencies encompassed in a competency framework for medical students, they required support in order to enhance their abilities in teaching and assessing these competencies (Bandiera *et al.*, 2006). Whilst a presentation followed by questions and discussion was provided for tutors who supported students in understanding how to use the PDF, time and resources did not allow for extended training on the assessment of competencies and provision of guidance for further development where necessary. However, future work might involve the development of a comprehensive training for tutors. Tutors could be involved in evaluating students' self-assessments and providing them with support and guidance in areas where weaknesses have been identified as well as ways in which they could enhance other competencies.

The use of the PDF was explored in two UK schools of pharmacy. Future work may explore the use of the PDF in other schools of pharmacy in the UK as well as in other countries. The PDF may be adapted to different curricula as well as for the use of first and second year students. Those who self-assessed their competencies three times during the academic year had better exam results than those who completed just one or two assessments. Further work may explore if students who had better performance during the undergraduate degree will also have a good performance during their pre-registration year.

Competency frameworks seem to be the way forward not only for pharmacy but also for other healthcare professionals, to ensure their competence and ability to identify their own limitations. However, professional development frameworks

should be used as a tool to support learning rather than as tools to identify competent or not competent healthcare professionals.

6.6 Conclusions

This research aimed to develop and evaluate the use of a PDF for pharmacy undergraduate students based on a competency based approach. The iterative process used to develop the PDF and the various groups of pharmacy students, pharmacy academics and stakeholders in pharmacy ensured the face and content validity of the PDF. The findings from the evaluation of the use of the PDF demonstrated its construct validity.

In the evaluation, the participating students' self-assessed competency increased over the three assessments, both in the "Professional Competencies" cluster and the "Delivery of Patient Care Competencies" clusters. All correlations found between the PDF and students' exam results were positive, implying that the self-assessed competency and the objectively assessed performance are not opposites of each other. Positive correlations were also found between the PDF and students' self-directedness towards learning. Additionally, the number of correlations between the students' self-assessed level of competency and self-directedness towards learning increased over the three assessments. In conclusion, all these findings show the validity of the PDF as a tool which supports learning. Further research is required to investigate how the PDF can be used to support pharmacy undergraduate students in developing and demonstrating their competencies, and to explore how the use of the PDF can support the students in achieving better performance.

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8 Appendices

Appendix 1: Ethics approval form for first version of protocol

University of Bath
Department of Pharmacy & Pharmacology

Ethics approval of Research Proposals – Peer Review Process
This form should be used to obtain independent review of ANY research involving human subjects, including undergraduate projects and unfunded projects. Applicants should complete their contact and project details then pass this form to Chair of the Research Committee (Prof R M Tyrrell prsrmt@bath.ac.uk) for allocation of reviewer. The reviewer should be independent from the research project and be familiar with the proposed research methods. Ideally where possible the reviewer should not be line managed by the applicant. Where NHS Research Ethics Committee approval is also required (see www.corec.org.uk) this form should accompany the NHS application as evidence of internal ethical review.

Name of Applicant: Ioana Stupariu

Email address: i.stupariu@bath.ac.uk

Title of Project: Development of undergraduate pharmacy student competency framework

Name of peer reviewer: Dr Jenny Scott

Position and Department/School: Senior Lecturer in Pharmacy Practice; P&P.

Comments of Peer Reviewer (continue over if needed).

This is an interesting project, which has the support of collaborators in other institutions and potential to bring benefit to the pharmacy undergraduate curriculum. I have made several methodological comments on the protocol, but limit my comments here to the ethical review:

(1) The issue of potential coercion needs to be considered. Universities hold a great power over their students, as career pathways are influenced by degree outcomes. It is possible that students may feel obliged to participate or unable to decline in the context of 'en mass' recruitment procedures (i.e. talking to large groups instead of 1-2-1). Consideration needs to given to how this would be managed and input from student representatives is advocated.

(2) It is not clear how consent is to be obtained, by whom and in what form.

(3) Consideration needs to be given to how long potential participants are given to decide to take part. Convention usually dictates minimum of 24 hours in non emergency situations.

(4) May those exposed to the intervention share it with 'controls'? How could this be avoided or minimised or at least monitored?

(5) How might you control for other factor(s) that could influence your measured outcomes?

(6) Is there any existing evidence that supports the hypothesis that a framework may improve outcomes? i.e. do you have equipoise?

(7) There are a lot of focus groups proposed and whereas this is not directly an ethical issue, studies that cannot meet their objectives do raise ethical concerns, Have you any feel for how likely you are to recruit all the participants needed or to complete the work in the allotted time? You need to build in time for errors, slippage and unplanned events.

(8) Lastly, a legal meets ethical issue. As this is research and not part of the student's education you need consent from students to access their personal data including marks and information held for academic purposes. The Data Protection Act does not permit you automatic access rights as you are doing this for research purposes not in relation directly to their education. You need to record consent to access student information from each individual participant.

Approved by:

Name: Jenny Scott Signature: 

Position: Senior Lecturer Pharmacy Practice Date: 24/10/08

Appendix 2: Ethics approval form for second version of the protocol

University of Bath
Department of Pharmacy & Pharmacology

Ethics approval of Research Proposals – Peer Review Process
This form should be used to obtain independent review of ANY research involving human subjects, including undergraduate projects and unfunded projects. Applicants should complete their contact and project details then pass this form to Chair of the Research Committee (Prof R M Tyrrell prsrmt@bath.ac.uk) for allocation of reviewer. The reviewer should be independent from the research project and be familiar with the proposed research methods. Ideally where possible the reviewer should not be line managed by the applicant. Where NHS Research Ethics Committee approval is also required (see www.corec.org.uk) this form should accompany the NHS application as evidence of internal ethical review.

Name of Applicant: Ioana Stupariu

Email address: i.stupariu@bath.ac.uk

Title of Project: *Developing a competency framework for pharmacy undergraduate students*

Name of peer reviewer: Jenny Scott

Position and Department/School: Senior lecturer, Dept Pharmacy & Pharmacology

Comments of Peer Reviewer (continue over if needed).

This review relates to an updated protocol received for the above study on 19 January 2009. It is suggested that protocol version numbers are allocated to assist with referencing to various versions. A previous review was conducted 21.10.08 on the previous version and therefore aspects of this still apply.

The study is based in three UK schools of pharmacy, ULSOP, King's and Bath. It has already begun. These comments are limited to the proposed work in the revised protocol that is yet to be completed.

The key ethical issues that relate to this study are:

Consent – all participants whether students or academic staff or pre-reg tutors need to be able to exercise free choice to take part without feeling that refusal will be damaging to them. This is particularly important for the students as the subject matter relates to performance and ultimately degree attainment. In this sense they may be considered a 'vulnerable group' as the power dynamic with academic staff is so skewed. It is suggested that the design should be such that opt-in methods are clearly used so facilitating free participation and refusal. Students should know taking part or not will not affect the way they are assessed or treated with respect to assessment. There may be subtle and unfounded beliefs of students that refusal is not 'wise' therefore clear efforts are needed to make sure they understand this is a research project of no as yet proven direct benefit to them.

Access to confidential information for research purposes –the Data protection act makes clear that organisational keeping of and access to information should be for intended purposes related to the work of the company/service/institution. Consequently data access it is now considered an ethical issue. Although academics, including the academic supervisors, can access student data e.g. performance results from exams and assessments, for the purposes of their job role *as teachers*, this would not be considered to extend to research purposes, certainly not of a third party PhD student. Therefore consent to access and hold personalised student data is advocated and the use of coding recommended.

Confidentiality –this is considered in the protocol. Data is anonymised as best as it can be. Tapes are kept securely. It must be remembered that confidentiality cannot be assured from a focus group setting and therefore all members must accept this, whilst being asked to adhere to the keeping of confidentiality.

Research governance – the use of public service resources to underpin research is commonly considered to be an ethical issue. Whereas this does not preclude the undertaking of research on subjects employed in the public sector, research governance practice suggests that approval from management is sought to confirm that the time of staff members (and hence institutional costs) are acceptable to the institution.

Approved by:

Name: _Jenny Scott_____ Signature: 

Position: Senior lecturer in pharmacy practice Date: ___30 Jan 2009____

Appendix 3:

Topic guide for the focus group with pharmacy students a University A (FG1)

Thank you, all, for coming to this focus group session. Has anyone participated in a focus group interview before?

First some housekeeping issues: while I would like to record this discussion, we can assure you that you and your views discussed here today will not be identifiable in any report I may write. Equally, we would like to ask you not to talk about any issues discussed here with anyone else than those present today unless otherwise agreed. This session will take approximately one hour. It would be fabulous if everyone participates!

So, let's start with discussing what springs into your mind when you think about key or transferable skills.

Great, now we would like you to brainstorm together what these skills are. Could everyone think of three/five top key or transferable skills you would like to develop or have already developed? To give everyone a bit more time to think, please start by saying the first skill. It's OK if you say the same skills. We'll write these on a flip chart.

How would you develop these skills?
How would you use these skills? When would they be useful? How useful are they?

Based on your brainstorming and literature we have prepared post-its with key and transferable skills. We would like you to discuss together where in the MPharm programme you have practised these skills (or where they should develop). There are enough post-it notes for all the four years of the programme and also for the life after the programme. If you think that some of the skills are irrelevant you can put them under the not applicable column. You have 20 minutes for this exercise. Before we finish the session, would you have any more comments?
THANK YOU!

Appendix 4:

Topic guide for the workshop with pharmacy academics at the International Social Pharmacy Workshop (WK1)

My name is Ioana Stupariu, I am a Romanian registered pharmacist and at the moment I am doing my PhD at the Department of Pharmacy and Pharmacology, University of Bath, UK. The aim of my project is to identify the competencies of pharmacy undergraduate students and to develop a competency framework. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. It is well known that healthcare professionals are encouraged to assess their own skills and knowledge to develop professionally. However, self-appraisal is difficult to achieve and requires certain skills and insights. One way to guarantee that all pharmacists can self-appraise their competence and attain and maintain their competence is to ensure that pharmacy undergraduate students are able to assess their abilities and performance prior to graduation. This requires the identification of the competencies pharmacy undergraduate students are expected to develop.

You are invited to participate in a focus group discussion on these competencies. With your consent the discussion will be recorded. All the data collected will be strictly confidential and anonymous. No-one will be identified through the analysis but the discussion will be attributed to participants of the 15th International Social Pharmacy Workshop. The recordings will be stored safely and deleted after 5 years. You may withdraw without giving a reason at any time. If there are any questions please ask now. Does everyone agree to participate and consent for the discussions to be recorded? Thank you, now we can start. My colleagues X and Y are going to help me to run this workshop.

<u>Instructions</u>
Participants will be divided into three focus groups. Each of us (IS, X, Y) will run one group regardless how many participants will be attending the workshop.

After they split into groups, IS/X/Y will ask the participants to fill in the personal characteristic form. This is a form that will help me to know a little bit more about the background of the participants. The questions in this form won't be used to identify any of the participants but to describe the characteristics of the participants. Now that this has been done we can start the discussion groups. When IS/X/Y will switch the recorders on, they will be the one who starts talking.

The questions would be (instructions and a script will follow):

Which competencies do you expect pharmacy undergraduate students to develop during university? The participants will be asked the participants to give five examples each.

In the list provided (which includes 10 examples of competencies) can you please rank the four most important ones that you think pharmacy undergraduate students should develop? We will go through these rankings together.

Why do you think the ranked competencies are important?

If there is time left, the following questions can be asked:

How long is the pharmacy course in your home country?
In which year of university do you think the brainstormed competencies should be developed?

Script for the topic guide
1. Thank you very much for coming to this workshop. I would like you to brainstorm which competencies you expect pharmacy undergraduate students to develop during university. IS/X/Y will ask you for one competency in turn so that each of you has the chance to think about and give five examples. IS/X/Y will give you a minute to think and then we can start. IS/X/Y will write these competencies on a flip chart.

If the participants are silent, and don't start brainstorming at all, IS/X/Y can ask them to work in pairs for five minutes, brainstorming on which competencies they expect pharmacy undergraduate students to develop during university (ten examples). And then they can tell to the rest of the group their examples. They should start talking, so for the rest of the questions IS/X/Y will follow the script. And if they still don't talk then IS/X/Y can let them to continue working on the following questions in pairs.
Great! Thank you very much for this.

2. IS/X/Y will give you a list where there are listed ten of the competencies that IS has previously identified in the literature and they represent the ones mentioned often in literature. The competencies are listed randomly. IS/X/Y will ask them to rank the four most important ones that in their perception pharmacy undergraduate students should develop. If you think that any of the most important competencies in your view is missing from the list provided, please write them on the bottom of the list and rank them.

Let's see your thoughts now. (IS/X/Y will write the rankings on a flipchart and if there are similarities IS/X/Y will write down how many people agreed that a specific competence was ranked as no.1/2/3/4).

3. Why do you think these competencies are important? Why are there differences or similarities?

If there still is time:
4. Can you tell me how long the pharmacy course is in your home country?

5. Ok, thinking for example a pharmacy course that lasts four years, in which year do you think the brainstormed competencies should be developed? That's great, thank you very much.

Feedback to the whole group
IS/X/Y will feedback to all the participants what has been discussed in each group. IS will lead and will wrap up the workshop with final thanks.

Appendix 5:

List of the competencies used during the workshop with pharmacy academics at the International Social Pharmacy Workshop (WK1)

Communications skills: written and oral

Problem solving

-gathering information (accesses information, summarises information, having up to date information),

- analysing information (evaluates information, identifies problems)

Team working

- working with other pharmacy undergraduate students,
- working in multidisciplinary undergraduate student teams

Interpersonal skills:

- ability to interact effectively with patients, the public and healthcare professionals

Decision making:

- identify the most appropriate solution and justify the decision taken

Professionalism:

- respecting confidentiality,
- recognising own limitations,
- showing confidence,
- having an ethical attitude and approach

Numeracy:

- calculation of medicine doses and dosage regimens

Information technology skills:

- word processing, database use, archiving data and information, internet communication

Time management and organisation:

- as evidenced by the ability to plan and implement efficient and effective modes of working

Data handling and analysis:

- acquisition, transformation, interpretation and critical evaluation of data

Appendix 6:

Participant characteristic form for participants at the workshop with academics at the International Social Pharmacy Workshop

This form will help us to know a little more about the background of the participants. Please tick as appropriate and follow other instructions.

1. Gender
Male ☐ Female ☐

2. Which is your country of origin?

……..

3. Which country do you study/work in at the moment? If you work go to question number 7.

……..

4. How long is the pharmacy degree in your country?

……..

5. Which year are you in?

……..

6. Do you have any other degree?
Yes ☐ No ☐

7. What was your first degree in?

.....

8. When did you complete your first degree?

Year……..

9. Do you have any other degree?

Yes ☐ No ☐

If yes please specify: ……...

10. Do you have any other qualifications?

Yes ☐ No ☐

If yes please specify: ……...

11. Where do you work:

Governmental organisation ☐ Hospital/secondary care ☐

Non-governmental organisation ☐ Community/primary care ☐

Academia ☐

Other(pleasespecify)……

12. What is your current position within the organisation?

……

13. How long have you been in your current position?

……. Years …….Months

Thank you!

Appendix 7:

Topic guide for the workshop with pharmacy students at the International Pharmaceutical Students' Federation Congress (WK2)

Participants will be divided into two or three groups depending on how many will participate in the workshop. Participants will be given the participant characteristic form to fill it in. We will tell them to keep the form until we will come to collect them.
The questions for the workshop would be (instructions and a script will follow):

1. What are the competencies that you think pharmacy undergraduate students are developing or should develop in order to be fit to practice (X will explain in intro what this means)?
2. How would you like to develop these (brainstormed competencies)?
3. What would you look for in a competency framework?

Script for the workshop:
Participants will be split into three groups.
1. Thank you very much for coming to this workshop. I would like you to brainstorm the competencies you think pharmacy undergraduate students develop or should develop during university. Each member of the group will brainstorm on four examples. IS/X/Y will write all your examples on a flipchart. After finishing with the brainstorming each group will feed back to the other groups the brainstormed competencies.

If the participants are silent, and don't start brainstorming at all, IS/X/Y can ask them to work in pairs for five minutes, brainstorming on which competencies they think pharmacy undergraduate students develop or should develop during university (ten examples per pair, this is due to the fact that if they work in pairs they may tend to give less examples; asking them ten I make sure they list at least eight). And then they can tell to the rest of the group their examples. They should start talking, so for the rest of the questions IS/X/Y will follow the script. And if they still don't talk then IS/X/Y can let them to continue working on the following questions in pairs.
Great! Thank you very much for this.

2. How would you like to develop these competencies? If they don't start talking we can give them the example of how communication may be developed.

Participants will come together. IS will explain her PhD and will explain also what competency frameworks are and what they use for. About the PhD: The aim of my project is to identify the competencies of pharmacy undergraduate students and to develop a competency framework. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice.

About the competency frameworks: a competency framework is a complete collection of competencies that are thought to be essential to effective performance. Participants will be divided into the same groups again.

3. How do you think it should look like for students to use it?

4. What would you look for in a competency framework? Here we can give them examples of other frameworks and they can mention what they like and what they don't like at each of the examples. We will take as an example the personal competencies from

GLF, Australian and Canadian competency frameworks for pharmacists. Each group will present their thoughts to the other groups.

Appendix 8:

Participant characteristic form for participants at the workshop with pharmacy students at the International Pharmaceutical Students' Federation Congress (WK2)

This form will help us to know a little more about the background of the participants. Please tick as appropriate and follow other instructions.

1. Gender
Male ☐ Female ☐

2. Which year were you born in?

Year……

3. Which is your country of origin?

……

4. Which country do you study/work in at the moment?

……..

5. When did you start your pharmacy degree?

Year…….

6. If you are currently studying pharmacy, which year are you in?

……..

7. If you have completed your pharmacy studies, when was this?

……..

8. Do you have any other degree or are you currently studying for one?

Yes, I do have another degree ☐
If yes, please specify which degree……..
If you have another degree which year did you complete it?
Year……

Yes, I am currently studying for a degree ☐

No, I do not have any other degree and I am not currently studying for one ☐

9. If you are currently studying, where would you like to work after completing your studies?

Governmental organisation ☐ Hospital/secondary care ☐

Non-governmental organisation ☐ Community/primary care ☐

Academia ☐

Other (please specify)
……..……..…….....

Questions 10 to 12 are for those who are working either during their studies, or after having completed their studies.

10. Where do you work:

Governmental organisation ☐ Hospital/secondary care ☐

Non-governmental organisation ☐Community/primary care ☐

Academia ☐

Other (please specify
…….....

11. What is your current position within the organisation?

……

12. How long have you been in your current position?

…… Years ……Months

Thank you!

Appendix 9:

Recruitment letter for focus groups

I would like to invite you to take part in a research study into developing a competency framework for pharmacy undergraduate students.

Competency frameworks have been developed for General, Advanced and Consultant level pharmacy practitioners (Antoniou et al., 2005; Meadows et al., 2004). Competency frameworks support the assessment and development of competencies: behaviours that individuals demonstrate when effectively undertaking tasks relevant to their jobs. A competency framework for MPharm students have yet to be developed and could prove valuable as teaching and learning tools to prepare them for professional practice. The aim of the project is to identify competencies for undergraduate pharmacy students and to develop a competency framework.

You have been approached as an academic at University A,B or C. In the focus group that you have been invited to take part to, you will be asked to discuss a list of competencies/ a draft version of the framework. The focus group will take part at the University where you are based, at a convenient time for you and will take up to one hour. There are expected to take part up to seven other academics. Refreshments will be provided during the discussion.

Please do not hesitate to contact me if you would like more information.

References:

1.Antoniou S, Webb DG, McRobbie D, Davies JG, Wright J, Quinn J, Bates IP. A controlled study of the general level framework: Results of the South of England competence study. Pharmacy Education 2005; 3-4: 201-7.

2. Meadows N, Webb D, McRobbie D, Antoniou S, Bates I, Davies G. Developing and validation a competency framework for advanced pharmacy practice. Pharmaceutical Journal 2004: 273: 789-792.

Appendix 10:

Model of information sheet for participants at the focus groups with pharmacy academics at Universities A, B and C

Developing a competency framework for pharmacy undergraduate students

We would like to invite you to participate in this research project. Please read the following information. If you have any questions please don't hesitate to ask us.

Aim and possible benefits of the study

The aim of the project is to identify competencies of undergraduate pharmacy students and to develop a competency framework. Competencies are the knowledge, skills, attitudes and behaviours that an individual develops through education, training and work experience. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. Healthcare professionals are encouraged to assess their own skills and knowledge to develop professionally [1,2]. However, self-appraisal is difficult to achieve and requires certain skills and insights [3]. One way to guarantee that all pharmacists can self-appraise their competence and any arising gaps is to ensure that pharmacy undergraduate students are able to assess their abilities and performance prior to graduation. This requires the identification of the competencies pharmacy undergraduate students are expected to develop. As an academic, through your contribution to the study, you may influence the identification of the competencies that undergraduate students should develop during their degree and the development of a competency framework. A report on the findings of this part of the study will be provided to the participants upon request.

Participants

You have been approached as an academic at University A, B or C. The project is a collaboration between three universities.

Participation

Participation in the study involves taking part in focus group with up to seven other academics. If you decide to participate you will be sent a list of competencies required of pharmacy undergraduate students or a draft version of the competency framework. In the focus group you and the other participants will be asked to comment on the material you received. The focus group will be arranged at the University where you are based, at a convenient time for you and the other participants and will last for up to one hour. The focus group discussions will be recorded and transcribed with your and the other participants' consent.

You have been provided this information sheet on the research project so that you can make an informed decision on whether to take part. A decision not to take part or to withdraw will not affect you in any way. You can withdraw at any time without giving any reason for your decision.

Ethics approval and confidentiality

Ethics approval has been obtained at the University of Bath for the whole project. All responses are strictly confidential and anonymous. No information identifying the participants will be revealed to a third party. All collected data will be kept in locked filing cabinets at the Department of Pharmacy and Pharmacology, University of Bath. Recordings of interviews will be kept for two to five years after the completion of the project and then deleted.

How to participate or request further information

If you decide to participate in this consensus development panel, please keep this information sheet and complete and sign the enclosed consent form. Please confirm your participation by sending me an email and bring the completed and signed consent form to the focus group. Upon receiving the email confirming your participation, I will contact you to arrange a suitable time and date for the focus group. If you would like to receive further information or have any questions regarding the research project, please do not hesitate to contact me.

References:

1. Antoniou S, Webb DG, McRobbie D, Davies JG, Wright J, Quinn J, Bates IP. A controlled study of the general level framework: Results of the South of England competence study. Pharmacy Education 2005; 3-4: 201-7.
2. Meadows N, Webb D, McRobbie D, Antoniou S, Bates I, Davies G. Developing and validation a competency framework for advanced pharmacy practice. Pharmaceutical Journal 2004: 273: 789-792.
3. Laaksonen R, Bates I, Duggan C. Training, clinical medication review performance and self-assessed competence: Investigating influences. *Pharmacy Education* 2007; 7: 257-265.

Appendix 11

Consent form

Developing a competency framework for pharmacy undergraduate students

This study has been approved by the: Ethical Review Process of the Department of Pharmacy and Pharmacology, University of Bath. If you have any questions arising from the information provided, or anything that you would like to clarify, please ask the researcher before you decide whether to participate in the consensus development panel.

Please complete this form if you consent to participate in the focus group/ interview. I have understood the purpose of the research project that was explained to me in the information sheet.

- I understand that if I decide at any time I no longer want to participate in this project, I can withdraw at any time, without giving any reasons.
- I understand the group discussion/ interview will be recorded, transcribed, coded and used for research purposes only. I understand participants will not be identified, and all the data will be strictly confidential and anonymous.

I_____

agree that the research project named above has been explained to me and I agree to take part in this study. I have read both the notes written above and the information sheet about the project, and I understand what the research study involves.

Signed_____ Date _____

Appendix 12

Topic guide for the focus group with academics at University A (FG2)

Hello, thank you everyone for coming. As it is described in the information sheet, the aim of my project is to identify the competencies of pharmacy undergraduate students and to develop a competency framework. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. At the beginning of the list of competencies, I have put the explanations for competency, competence, performance and clusters so that you can understand better these words.

As an overall image of the panel I'll tell you briefly what we will be doing. First, in groups you will be discussing different issues on the list of competencies, than you will get together and try to get a consensus and in the end I would ask you to group these competencies.

Did you have the time to have a look at the list of competencies that I emailed? If YES, go on. If NO, give them 2 minutes to go through the list individually. In case you haven't brought it, here is the list of competencies that I emailed you. What I would like you to do, is to get you think about whether any competencies , that you think pharmacy undergraduate students should develop are missing from the list provided, or whether there are some that should not be there .IS/X: Participants will be divided into three groups. Please work with at least one person that who isn't on your group. One group will discuss any additions to the list provided, another will discuss the competencies they think should be taken out and the third group will discuss the changes they think should be done (the way they are stated, the way they are explained).

Now, each group will feedback to the other groups what they came up with and together decide if everyone agrees or not what the group have said. So we will in turn talk about each of the tasks of each group. X will write down on the flipchart the competencies that agree to add or delete and the changes recommended. Thank you very much for your input. In the last 15 minutes can we please try and decide which competencies belong together. X will write down on the flipchart the grouping the academics suggest.
Thank you very much to all for attending.

Appendix 13:

Professional Development Framework (v1)

I. INTERPERSONAL
I.1. COMMUNICATION
I.1.1. Demonstrates the proper use of grammar I.1.2. Uses appropriate style layout in a written report/dissertation (document) I.1.3. Uses correct and appropriate English in texts/ express ideas in appropriate English I.1.4 Communicates clearly and effectively both orally and in writing with individuals and audiences I.1.5. Uses appropriate terminology according to the audience (specialist or non-specialists) I.1.6. Ability to talk in public/ in front of a group I.1.7. Uses visual aids appropriately I.1.8. Participates in discussion I.1.9 Listens actively
I.2.TEAM WORK
I.2.1. Demonstrates ability to work with other pharmacy students I.2.2. Demonstrates ability to work with members of staff I.2.3. Understands the roles/contribution of different members of staff I.2.4. Demonstrates cooperation within team (pharmacy students, staff)
I.3. DIPLOMATIC
I.3.1. Is fair and tactful in all dealings with staff and colleagues
I.4. RESPECTFUL
I.4.1. Demonstrates regard for staff, colleagues and other personnel I.4.2. Acts in a way that shows he/she is a professional student I.4.3. Adheres to dress code (written and unwritten)
I.5. ETHICAL BEHAVIOUR
I.5.1. Acts in patients' best interest I.5.2. Understands the Code of Ethics I.5.3. Understands the need for confidentiality within university and practice settings I.5.4. Demonstrates an attitude of open-mindless towards others and towards situations I.5.5. Does not show prejudice I.5.6. Demonstrates appreciation and consideration towards others I.5.7. Puts patients' needs above his/her own I.5.8. Assumes risk for own actions (behaviour and decisions)
I. 6. PROBLEM SOLVING
I.6.1. Identifies the problem/s I.6.2. Gathers information about the problem I.6.3. Evaluates/analyzes the information I.6.4. Determines possible solutions I.6.5. Actively works to resolve the issue/s
II. MANAGEMENT (PLANNING) AND ORGANISATION/SELF-MANAGEMENT
II. 1. TIME MANAGEMENT
II.1.1.Is able to plan own study time (allocates appropriate amounts of time for studying) II.1.2.Is able to work towards and meet deadlines (uses appropriate amount of time) II.1.3.Utilises (make practical use of) others' time wisely II.1.4.Arrives on time for lectures / workshops
II.2. PLANNING
II.2.1. Is able to plan own objectives II.2.2. Is able to set own objectives II.2.3. Is able to meet own objectives
II.3. RESPONSIBILITY AND ACCOUNTABILITY
II.3.1. Holds oneself accountable for completing tasks that he/she is responsible for

II.3.2. Follows through the task through relevant means for which one is responsible II.3.3. Prioritises tasks effectively II.3.4. Is able to assume own mistakes II.3.5.Can be counted on to fulfil responsibilities and meet expectations (reliable and dependable; trustworthy)

III. STUDY ABILITIES

III.1. INFORMATION PROCESSING AND UNDERSTANDING
III.1.1. Uses appropriate resources to gather/seek information III.1.2. Decides the relevance and trustworthiness (scientific referencing) of the information found III.1.3. Interprets the relevant information III.1.4. Presents information in a coherent manner (uses appropriate ways to present the information) III.1.5. Assesses information quickly and reliably
III.2. SELF-DIRECTED IN UNDERTAKING TASKS (WORKS INDEPENDENTLY)
III.2.1. After initial instruction of tasks/ assignments initiates activities to complete them
III.3. INDEPENDENT AND SELF-DIRECTED LEARNING
III.3.1. Takes responsibility for one's own learning (Initiative in learning) III.3.2. Demonstrates desire to exceed the minimum expectations on outcomes III.3.3. Is able to negotiate obstacles in pursuing an objective and develop effective strategies for overcoming them (problem solving) III.3.4. Seeks help when and where appropriate
III.4. PRODUCES QUALITY WORK
III.4.1. Accurately completes tasks and assignments and meets their respective objectives
III.5. REFLECTIVE PRACTICE (SELF-ASSESSMENT)
III.5.1. Is able to stand back and review on activity or task, capture its essence III.5.2. Is able to systematically plan future steps for that activity/task III.5.3. Is able to evaluate what went well and what went wrong III.5.4. Is able to evaluate own strengths, values, weaknesses, progress and future learning objectives III.5.5. Accepts and applying feedback III.5.6. Responds openly and positively to feedback III.5.7. Is able to modify behaviour if needed
III.6. INFORMATION PROCESSING AND UNDERSTANDING
III.6.1. Understands referencing systems of books and journals III.6.2. Conducts library searches using appropriate keywords III.6.3. Finds books and journal articles both on the library catalogue and databases III.6.4. Understands referencing requirements and plagiarism
III. 7. COMPUTER (IT)
III.7.1. Is able to use relevant software Microsoft Office and specific software for workshops and practical classes III.7.2. Is able to manage files
III. 8. PERFORMING PHARMACEUTICAL CALCULATIONS
III.8.1. Is able to calculate doses III.8.2. Is able to calculate dilutions and concentration III.8.3. Is able to calculate weighing and measuring III.8.4. Is able to do pharmacokinetic calculations (drug potency) III.8.5. Is able to calculate electrolytes

IV. PHARMACEUTICAL ABILITIES

IV. 1. PHARMACEUTICAL KNOWLEDGE ABILITIES
IV.1.1.Understands the sources and properties of the drugs which form the biologically-active and therapeutic components of medicines/ Has the knowledge of chemical structure and reactivity of drugs and bio molecules appropriate to the design and synthesis of drugs IV.1.2.Knowledge and understanding of the design, manufacture and performance of drug dosage forms

IV.1.3.Knowledge of mechanisms of action and uses of drugs IV.1.4.Knowledge and understanding of how medicines are developed, manufactured and brought to the market IV.1.5.Understands and is aware of the systems for the quality assurance of products and pharmaceutical services IV.1.6.Knowledge of disease processes (understanding of clinical features and general medical management of diseases) IV.1.7.Knowledge and understanding for promoting health and wellness IV.1.8.Understands pharmacist's role in healthcare IV.1.9.Understands pharmacist's contribution to public health
IV.2 PHARMACY SPECIFIC ABILITIES
IV.2.1. Is able to appreciate the inter-relationship between formulation, drug delivery and therapeutic effectiveness IV.2.2.Is capable of formulating and preparing medicines for individual patient use
IV.2.3. Is able to supply medicines in accordance with pharmaceutical knowledge IV.2.4. Is able to supply medicines in accordance with legislation and codes of professional conduct and practice IV.2.5.Understands, evaluates and interprets prescriptions and other orders for medicines IV.2.6.Interprets patient and clinical data, including patient records held within practice settings IV.2.7. Is able to prevent and correct any problems by appropriate dispensing (identify drug use errors, drug noncompliance and other drug related problems) IV.2.8.Conducts basic health evaluation for appropriate counselling to patients (recognise common disease states and make appropriate responses to presented symptoms) IV.2.9.Explains other related problems to the patients' health problem IV.2.10.Advises patients (and other healthcare professionals) on the safe and effective use of medicines IV.2.11. Is able to undertake risk assessments concerning pharmaceutical procedures and practices IV.2.12.Explains the concepts of medicines management and pharmaceutical care

Appendix 14:

Professional Development Framework (v2)

I. INTERPERSONAL
I.1.COMMUNICATION
I.1.1. I am able to demonstrate the proper use of grammar I.1.2. I consider I use appropriate style layout in a written report/dissertation (document) I.1.3. I consider I use correct and appropriate English in texts/ express ideas in appropriate English I.1.4. I consider I communicate clearly and effectively orally with individuals and audiences (colleagues, members of staff from faculty) I.1.5. I consider I communicate clearly and effectively in writing with individuals (colleagues, patients, members of staff from faculty) and audiences (colleagues members of staff from faculty) I.1.6. I consider I use appropriate terminology according to the audience (specialist: colleagues, academics, HCPs) or non-specialists: patients, general audience, other professionals) I.1.7. I am able to talk in public/ in front of a group I.1.8. I consider I use visual aids appropriately I.1.9. I am able to participate in class or group discussion I.1.10 I am able to listen attentively and synthesize accurately relevant information I.1.11. I show empathic response where appropriate.
I.2. TEAM WORK
I.2.1.I am able to work with other pharmacy students to achieve a common purpose I.2.2. I am able to work with members of staff I.2.3. I recognise the roles/contribution of different members of staff (from university) I.2.4. I am able to demonstrate cooperation within team (pharmacy students) I.2.5. I am able to solve conflicts between peers
I.3. RESPECTFUL
I.3.1. I am fair and tactful in all dealings with staff, other pharmacy students and patients I.3.2. I demonstrate regard for staff, pharmacy students, other personnel and patients I.3.3. I act in a way that shows I am a professional student I.3.4. I adhere to dress code (written and unwritten) at University and when going on placements
I.4. ETHICAL BEHAVIOUR
I.4.1. I act in patients' best interest I.4.2. I am able to conform with the Code of Ethics I.4.3. I am able to conform to the need for confidentiality within the University and practice settings I.4.4. I demonstrate an attitude of open-mindedness towards others and towards situations I.4.5. I do not show prejudice I.4.6. I am able to demonstrate appreciation and consideration towards others I.4.7. I put patients' needs above his/her own I.4.8. I take responsibility for my own decisions and actions
I. 5. PROBLEM SOLVING
I.5.1. I am able to identify the problem/s I.5.2. I am able to gather information about the problem I.5.3. I am able to identify options to resolve the problem I.5.4. I am able to identify and recognise self-limitations and seek appropriate assistance I.5.5. I am able to explore the strengths and weaknesses of options I.5.6. I am able to negotiate obstacles in pursuing an objective and develop effective strategies for overcoming them I.5.7. I am able to discuss with others the options I.5.8. I am able to identify where compromise in problem solving is necessary I.5.9. I am able to suggest and if appropriate, implement solutions to problems; I.5.10.I am able to evaluate the outcome of the solution after implementation, and if necessary redefine the problem;

II. MANAGEMENT AND ORGANISATION
II.1. TIME MANAGEMENT
II.1.1. I am able to plan my own study time (allocates appropriate amounts of time for studying) II.1.2. I am able to work towards and meet deadlines (uses appropriate amount of time) II.1.3. I utilise (make practical use of) others' time wisely (manage time appropriately and efficiently) II.1.4. I arrive on time for any appointments or commitments (lectures / workshops/ placements/ meetings with tutor
II.2. PLANNING
II.2.1. I am able to set my own SMART learning objectives of how to meet the learning outcomes of a course or the degree II.2.2. I am able to plan my learning objectives of how to meet the learning outcomes of a course or the degree II.2.3. I prioritise tasks effectively II.2.4. I take responsibility for following through the plan II.2.5. I assess if I met the objectives
II.3. RESPONSIBILITY AND ACCOUNTABILITY
II.3.1. I am able to hold myself accountable for completing tasks that I am responsible for II.3.2. I follow through the task through relevant means for which I am responsible II.3.3. I am able to reflect on and learn from the actions taken to follow through the task (whether or not completed) II.3.4. I can be counted on to fulfil responsibilities and meet expectations (reliable and dependable; trustworthy)
III. STUDY ABILITIES
III.1. INFORMATION PROCESSING AND UNDERSTANDING
III.1.1. I use appropriate resources to gather/seek information III.1.2. I decide the relevance and trustworthiness (scientific referencing) of the information found III.1.3. I interpret the relevant information reliably III.1.4. I present information in a coherent manner (uses appropriate ways to present the information) III.1.5. The tasks and assignments I hand in are complete, accurate and meet their respective objectives
III.2. INDEPENDENT AND SELF-DIRECTED LEARNING
III.2.1. After initial instruction of tasks/ assignments I initiate activities to complete them III.2.2. I assess my own knowledge and abilities independently III.2.3. I seek for help when appropriate and where appropriate
III.3. REFLECTIVE PRACTICE (SELF-ASSESSMENT)- NEEDS DEFINING (NOT ONLY LABS)
III.3.1. I am able to reflect on activity or task, capture its essence III.3.2. I am able to systematically plan future steps for that activity/task III.3.3. I am able to evaluate what went well and what went wrong III.3.4. I am able to evaluate own strengths, values, weaknesses, progress and future learning objectives III.3.5. I am able to give feedback to others III.3.6. I accept feedback and implement suggestions for improvement III.3.7. I respond openly and positively to feedback III.3.8. I am able to modify behaviour if needed
III.4. INFORMATION PROCESSING AND UNDERSTANDING
III.4.1. I understand referencing systems of books and journals III.4.2. I conduct library searches using appropriate keywords III.4.3. I find books and journal articles both on the library catalogue and databases III.4.4. I conform with referencing requirements and avoid plagiarism
III. 5. COMPUTER (IT)
III.5.1. I am able to manage files III.5.2. I am able to use Word, spreadsheets, email, internet, presentation software. and specific

software for workshops and practical classes

IV.PHARMACY ABILITIES

IV. 1. PHARMACY PRACTICE ABILITIES
IV.1.1. I am able to gather and organise accurate and comprehensive patient information to identify ongoing or potential drug therapy problems
IV.1.2. I am able to interpret and evaluate patient and drug-related data needed to identify actual or potential drug therapy problems
IV.1.3. I am able to evaluate laboratory test results and pharmacokinetic data
IV.1.4. I am able to identify the cause and significance of adverse drug interactions
IV.1.5. I am able to evaluate the significance of actual or potential drug interactions
IV.1.6. I am making sure that there is no excessive medication use or unnecessary drug duplication
IV.1.7. I am able to assess patient adherence to previously prescribed medications
IV.1.8. I am able to identify signs or potential indicators of drug misuse or abuse
IV.1.9. I am able to construct well built questions based on the patient's drug therapy problem(s) or needed information
IV.1.10. I am able to employ effective and efficient search strategies to find appropriate sources of drug and health information using a variety of information resources
IV.1.11. I am able to critically analyse all relevant literature, considering its applicability and validity to the information needed
IV.1.12. I am able to provide drug information clearly, accurately, concisely and in a timely manner in a language appropriate for the target audience
IV.1.13. I am able to apply principles of biochemistry, medicinal chemistry, pharmacology, and pathophysiology to select the appropriate drug(s)
IV.1.14. I am able to apply pharmacokinetic and pharmacodynamic principles to select the appropriate dose, dosage schedule, and drug delivery system
IV.1.15. I am able to identify and minimize or avoid drug interactions, adverse effects, and contraindications associated with the recommended drug therapy
IV.1.16. I am able to monitor patient for drug efficacy and toxicity
IV.1.17. I am able to anticipate, monitor for, and report adverse effects and drug interactions
IV.1.18. I am able to refer patients to other health care professionals when needed
IV.1.19. I am able to accurately prepare and dispense medication (s) prescribed
IV.1.20. I am able to educate patients and/or carers about drug therapy, and proper use of medical devices
IV.1.21. I am able to confirm patient understanding of counselling provided and clarify if needed
IV.1.22. I am able to promote health improvement, wellness and disease prevention
IV.2. PHARMACEUTICS
IV.2.1. I am able to identify, evaluate and explain the factors that affect the chemical stability of a drug under various environmental and packaging conditions
IV.2.2. I am able to identify and explain the properties of drug that influence dosage form design and its route of administration
IV.2.3. I am able to identify physical-chemical and formulation properties that make a drug suitable for modified release
IV.2.4. I am able to discuss the methods used for establishing the performance and quality of dosage forms
IV.2.5. I am able to identify and explain the dosage form features that influence therapeutic outcomes
IV.2.6. I am able to explain the influence of formulation , physiological, and anatomical factors on drug absorption from dosage forms
IV.2.7. I am able to discuss how compliance and adherence can be improved by appropriate dosage form selection
IV.2.8. I am able to select and recommend the best route of administration and dosage form for a patient
IV.2.9. I am able to identify, solve, and prevent drug therapy problems related to dosage form, delivery system, and route of administration
IV.2.10. I am able to explain and understand the concepts of pharmaceutical equivalence, bioequivalence and therapeutic equivalence

IV.3. PHARMACOKINETICS
IV.3.1. I am able to evaluate the basic pharmacokinetics and pharmacodynamic properties of a drug and relate that to the manner in which the drug is used therapeutically IV.3.2. I am able to identify and explain the physical/chemical characteristics of a drug that influences its absorption, distribution and elimination
IV.4. PHARMACOLOGY
IV.4.1. I am able to recognise the pharmacological classification to which a therapeutic agent belongs IV.4.2. I am able to select optimal drug therapy within a pharmacologic class based on knowledge related to absorption, distribution, metabolism and excretion IV.4.3. I am able to address and prevent side effects and toxicities from therapeutic agents by applying knowledge of mechanisms of toxicity IV.4.4. I am able to address and prevent drug-drug interactions, drug-food interactions by applying knowledge of pharmacodynamic and pharmacokinetic principles IV.4.5. Based on differences in pharmacological properties among drugs,I recommend changes in pharmacotherapeutic regimens that eliminate drug interactions, reduce side-effects, increase compliance and improve therapeutic outcomes
IV.5. MEDICINAL CHEMISTRY
IV.5.1. I am able to identify the chemical classification to which a drug belongs IV.5.2. I am able to determine the appropriate route(s) of drug administration based on the contribution of specific chemical features to drug solubility in biological fluids and delivery vehicles IV.5.3. I recommend changes in pharmacotherapeutic regimens based on chemical differences among drugs that relate to solving patient problems, providing patient-centred care IV.5.4. I am able to resolve drug therapy problems of individual patients by applying knowledge of drug chemistry across pharmacological classes
IV.6. ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY
IV.6.1. I am able to utilize and integrate knowledge of physiology, pathophysiology and anatomy in order to formulate a therapeutic care plan
IV.7. BIOLOGY (BIOCHEMISTRY AND MOLECULAR CELLULAR BIOLOGY)
IV.7.1. I am able to describe the structure, function and metabolic pathways for carbohydrates, amino acids and lipids IV.7.2. I am able to discuss the metabolism of lipoproteins, medical problems associated with abnormal lipoprotein levels and therapeutic agents used to treat lipid disorders IV.7.3. I am able to describe the metabolism of arachidonic acid and discuss the therapeutic implications related to the mechanism of NSAIDs and asthma therapy IV.7.4. I am able to describe the process involved in replication, transcription and translation of genetic information IV.7.5. I am able to describe the role of vitamin and minerals in metabolism and identify reactions utilised by these compounds IV.7.6. I am able to describe DNA recombination, and discuss the impact it has on production of proteins as drugs
IV. 8. PERFORMING PHARMACEUTICAL CALCULATIONS
IV.8.1. I am able to calculate dose IV.8.2. I am able to calculate dilutions and concentration IV.8.3. I am able to calculate weighing and measuring accurately IV.8.4. I am able to do pharmacokinetic calculations IV.8.5. I am able to monitor patients' responses to drugs IV.8.6. I correctly count and calculate the quantity of medications to dispense

Appendix 15:

Data collection form used at the workshop with pharmacy students at the British Pharmaceutical Students' Association Annual Conference

This form will help us to know your views in your engagement with the competency framework. Please tick as appropriate and follow other instructions.

1. Gender

Male ☐ Female ☐

2. Do you think a competency framework for pharmacy students is a useful tool?

Yes ☐ No ☐

3. Would you engage with the competency framework if it will be an extra-curricular activity?

Yes ☐ No ☐

If YES, please give three reasons why you would engage

a)……

b)……

c)……

If NO, please give three reasons why you wouldn't engage with it

a)……

b)……

c)……

4. Would you engage with the competency framework if it will be part of your course?

Yes ☐ No ☐

If YES, please give three reasons why you would engage

a)……

b)……

c)……

Thank you!

Appendix 16:

Recruitment letter for interviews

Dear X,

I would like to invite you to take part in interview as part of a research study into *developing a competency framework for pharmacy undergraduate students*, a collaboration between three universities. Please find an information sheet attached.

Competency frameworks have been developed for General, and Advanced and Consultant level pharmacy practitioners (Antoniou et al., 2005; Meadows et al., 2004). Competency frameworks support the assessment and development of competencies: behaviours that individuals demonstrate when effectively undertaking tasks relevant to their jobs. A competency framework for MPharm students is yet to be developed. It could prove valuable as a teaching and learning tool to prepare students for professional practice and support them in the difficult task of self-assessing competence. The aim of the project is to identify competencies for undergraduate pharmacy students and to develop a competency framework.

You have been approached as a member of the …….. In the interview, your views on the developed competency framework will be explored. The telephone interview will be organised at a convenient date and time for you, and will take up to half an hour. Please contact me if you would like to participate or would like to receive more information.

Thank you ever so much for your support!

Yours sincerely,

References:

1. Antoniou S, Webb DG, McRobbie D, Davies JG, Wright J, Quinn J, Bates IP. A controlled study of the general level framework: Results of the South of England competence study. *Pharmacy Education* 2005; 3-4: 201-7.
2. Meadows N, Webb D, McRobbie D, Antoniou S, Bates I, Davies G. Developing and validation a competency framework for advanced pharmacy practice. *Pharmaceutical Journal* 2004: 273: 789-792.

Appendix 17:

Information sheet for participants at interviews

Developing a competency framework for pharmacy undergraduate students

We would like to invite you to participate in this research project. Please read the following information. If you have any questions please don't hesitate to ask us.

Aim and possible benefits of the study

The aim of the project is to identify competencies of undergraduate pharmacy students and to develop a competency framework. Competencies are the knowledge, skills, attitudes and behaviours that an individual develops through education, training and work experience. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. Healthcare professionals are encouraged to assess their own skills and knowledge to develop professionally [1,2]. However, self-appraisal is difficult to achieve and requires certain skills and insights [3]. One way to guarantee that all pharmacists can self-appraise their competence and any arising gaps is to ensure that pharmacy undergraduate students are able to assess their abilities and performance prior to graduation. This requires the identification of the competencies pharmacy undergraduate students are expected to develop. As a pre-registration tutor, through your contribution to the study, you may influence the content of the competency framework. A report on the findings of this part of the study will be provided to the participants upon request.

Participants

You have been approached as a stakeholder in pharmacy and pharmacy education. The project is a collaboration between three universities.

Participation

Participation in the study involves taking part in an interview. If you decide to participate, you will be sent a draft of the competency framework. In the interview that you have been invited to take part to, you will be asked to give your views on the developed competency framework. The interview will be organised at a convenient date and time for you, and will take up to half an hour. Please do not hesitate to contact me if you would like more information. The interview will be recorded and transcribed with your consent. You have been provided this information sheet on the research project so that you can make an informed decision on whether to take part. A decision not to take part or to withdraw will not affect you in any way. You can withdraw at any time without giving any reason for your decision.

Ethics approval and confidentiality

Ethics approval has been obtained at the University of Bath for the whole project. All responses are strictly confidential and anonymous. No information identifying the participant will be revealed to a third party. All collected data will be kept in locked filing cabinets at the Department of Pharmacy and Pharmacology, University of Bath. Recordings of interviews will be kept for two to five years after the completion of the project and then deleted.

How to participate or request further information

If you decide to participate in this interview, please keep this information sheet. Please

confirm your participation by sending me an email. Upon receiving the email confirming your participation, I will contact you to arrange a suitable time and date for the interview. If you would like to receive further information or have any questions regarding the research project, please do not hesitate to contact me.

References:

4. Antoniou S, Webb DG, McRobbie D, Davies JG, Wright J, Quinn J, Bates IP. A controlled study of the general level framework: Results of the South of England competence study. Pharmacy Education 2005; 3-4: 201-7.
5. Meadows N, Webb D, McRobbie D, Antoniou S, Bates I, Davies G. Developing and validation a competency framework for advanced pharmacy practice. Pharmaceutical Journal 2004: 273: 789-792.
6. Laaksonen R, Bates I, Duggan C. Training, clinical medication review performance and self-assessed competence: Investigating influences. *Pharmacy Education* 2007; 7: 257-265.

Appendix 18:

Interview guide for the interviews with stakeholders in pharmacy and pharmacy education

Topic guide

1. Could you please tell me your opinion of competency development of pharmacy undergraduate students?
2. Have you come across competency frameworks before? Where? When?
3. What is your opinion about the use of a competency framework in the undergraduate level?
4. How could they be used effectively in the undergraduate degree?
5. How do you think a competency framework would influence students' performance?

Now, going to the competency framework itself…

6. Do you agree with the name of each cluster?
7. Do you agree with the competencies encompassed in each cluster? Would you suggest any changes? If Yes, which would these be?
8. Are the behavioural indicators, particularly the ones in the "pharmacy abilities" cluster, appropriately described?
9. Do you think the "pharmacy abilities" cluster is needed in the framework?
10. Would you group differently the competencies in this cluster? If yes, how?
11. Do you think the competencies in each cluster and the behavioural indicators within the competencies should be presented in a certain order? If YES, which would that be?
12. How would you take into account if a student brings along their record of developing competencies to the pre-registration interview?
13. What do you think would motivate students to engage with it?
14. Is there anything that you think might be relevant to the topic which we haven't talked about?

THANK YOU!

Appendix 19:

Professional Development Framework (v3)

I.PHARMACY ABILITIES
I.1.Pharmacy practice
I.1.1. Gather accurate and comprehensive patient information in order to evaluate patient care I.1.2. Interpret gathered patient and drug-related data needed to identify actual or potential drug therapy problems I.1.3. Evaluate the interpreted patient and drug-related data needed to identify actual or potential drug therapy problems I.1.4. Evaluate laboratory test results and pharmacokinetic data and use these to improve patient care I.1.5. Identify the cause and significance of adverse drug reactions I.1.6. Evaluate the significance of actual or potential drug interactions I.1.7. Assure that there is no excessive medication use or unnecessary drug duplication I.1.8. Identify signs or potential indicators of drug misuse or abuse I.1.9. Employ effective and efficient search strategies to find appropriate sources of drug and health information using a variety of information resources I.1.10. Provide drug information clearly, accurately, concisely and in a timely manner in a language appropriate for the target audience I.1.11. Apply pharmacokinetic and pharmacodynamic principles to select the appropriate dose, dosage schedule, and drug delivery system I.1.12. Check validity of the prescription I.1.13. Accurately prepare and dispense medication(s) prescribed I.1.14. Educate patients and/or carers about drug therapy, and proper use of medical devices I.1.15. Confirm patients' understanding of counselling provided and clarify if needed I.1.16. Assess patient adherence to prescribed medications I.1.17. Promote health improvement, wellness and disease prevention
I.2.Pharmaceutics
I.2.1. Make recommendations to patients and carers on the most appropriate manner in which to store medications to ensure drug stability I.2.2. Explain the properties of a drug that influence dosage form design and its route of administration to the patient I.2.3. Discuss how compliance and adherence can be improved by appropriate dosage form selection I.2.4. Select and recommend the best route of administration and dosage form for a patient I.2.5. Identify physical-chemical and formulation properties that make a drug suitable for modified release I.2.6. Explain the dosage form features that influence therapeutic outcomes I.2.7. Identify drug therapy problems related to dosage form, delivery system, and route of administration I.2.8. Discuss with the HCP the most appropriate form of dosage form, delivery system, and route of administration I.2.9. Explain the concepts of pharmaceutical equivalence, bioequivalence and therapeutic equivalence I.2.10. Apply knowledge of pharmacokinetics to patient treatment to help assess the optimum treatment I.2.11. Justify the decision of the chosen treatment based on knowledge of pharmacokinetics
I.3.Pharmacology
I.3.1. Recognise the pharmacological classification to which a therapeutic agent belongs I.3.2. Select optimal drug therapy within a pharmacologic class based on knowledge related to absorption, distribution, metabolism and excretion I.3.3. Apply knowledge of mechanisms of toxicity by addressing and preventing side effects and toxicities from therapeutic agents

I.3.4. Use knowledge of pharmacological properties of drugs, to recommend changes in pharmacotherapeutic regimens that improve therapeutic outcomes (eliminate drug interactions, reduce side-effects, increase compliance
I.4.Medicinal chemistry
I.4.1. Identify the chemical classification to which a drug belongs I.4.2. Determine the appropriate route(s) of drug administration based on the contribution of specific chemical features to drug solubility in biological fluids and delivery vehicles I.4.3. Recommend changes in pharmacotherapeutic regimens based on chemical differences among drugs
I.5.Anatomy, physiology and pathophysiology
I.5.1. Utilise and integrate knowledge of physiology, pathophysiology and anatomy in order to formulate a therapeutic care plan
I.6.Biology (Biochemistry and molecular cellular biology)
I.6.1. Describe the structure, function and metabolic pathways for carbohydrates, amino acids and lipids I.6.2. Discuss the metabolism of lipoproteins, medical problems associated with abnormal lipoprotein levels and therapeutic agents used to treat lipid disorders I.6.3. Describe the process involved in replication, transcription and translation of genetic information I.6.4. Describe the role of vitamin and minerals in metabolism and identify reactions utilised by these compounds
I.7.Pharmaceutical calculations and statistics
I.7.1. Calculate appropriate dose I.7.2. Calculate weighing and measuring accurately I.7.3. Calculate dilutions and concentration I.7.4. Do pharmacokinetic calculations I.7.5. Count and calculate correctly the quantity of medications to dispense I.7.6. Explain statistical and epidemiological information to target audience
II.STUDY ABILITIES
II.1.Information processing and understanding
II.1.1. Use appropriate resources to gather/seek information II.1.2. Decide the relevance and trustworthiness (scientific referencing) of the information found II.1.3. Interpret the relevant information reliably II.1.4. Present information in a coherent manner (use appropriate ways to present the information) II.1.5. Hand in tasks and assignments that are complete, accurate and meet their respective objectives II.1.6. After initial instruction of tasks/ assignments initiate activities to complete them II.1.7. Assess my own knowledge and abilities independently II.1.8. Understand and am able to use referencing systems of books and journals in dissertations and project reports II.1.9. Conduct library searches using appropriate keywords II.1.10. Find books and journal articles both on the library catalogue and databases II.1.11. Conform with referencing requirements and avoid plagiarism
II.2.Reflective practice (self-assessment)
II.2.1. Evaluate what went well and what went wrong in a learning experience II.2.2. Give feedback to others II.2.3. Accept feedback and implement suggestions for improvement II.2.4. Respond openly and positively to feedback II.2.5. Modify behaviour if needed
II.3. Computer (IT)
II.3.1. Use word processing, spreadsheets, email, internet, presentation software, and specific software for workshops and practical classes II.3.2. Manage files
III.PERSONAL MANAGEMENT AND PROBLEM SOLVING

III.1. Time management
III.1.1. Plan own study time III.1.2. Work towards and meet deadlines (use appropriate amount of time) III.1.3. Utilise (make practical use of) others' time wisely (manage time appropriately and efficiently) in meetings and group work III.1.4. Arrive on time for any appointments or commitments (lectures / workshops/ placements/ meetings with tutor)
III.2. Planning
III.2.1. Set my own SMART (specific, measurable, achievable, relevant and timed) learning objectives of how to meet the learning outcomes of a course or the degree III.2.2. Plan my learning objectives for how to meet the learning outcomes of a course or the degree III.2.3. Prioritise tasks effectively III.2.4. Take responsibility for following through the plan III.2.5. Assess if the objectives have been met III.2.6. Make full use of learning and development opportunities III.2.7. Identify your further learning needs III.2.8. Record your own learning and development process and outcomes III.2.9. Apply learning to practice
III.3. Responsibility and accountability
III.3.1. Hold oneself accountable for completing tasks that I am responsible for III.3.2. Follow through the task through relevant means for which I am responsible III.3.3. Reflect on and learn from the actions taken to follow through the task (whether or not completed) III.3.4. Be counted on to fulfil the responsibilities I have taken and meet the expectations III.3.5. Responsible for my own actions and the effect they may have on others learning
III.4. Problem solving
III.4.1. Identify the problem/s that require(s) solving III.4.2. Gather information about the problem III.4.3. Analyse information gathered III.4.4. Identify options to resolve the problem III.4.5. Explore the strengths and weaknesses of the options for resolving the problem III.4.6. Identify and recognise own limitations and seek appropriate assistance III.4.7. Discuss with others the options for solving the problem III.4.8. Able to identify where a compromise in problem solving is necessary III.4.9. Suggest and if appropriate, implement solutions to problems III.4.10. Evaluate the outcome of the solution after implementation, and if necessary redefine the problem III.4.11. Reflect and learn from previous problems

IV. INTERPERSONAL

IV. 1.Communication
IV.1.1. Demonstrate the correct use of grammar IV.1.2. Express ideas in appropriate English IV.1.3. Communicate clearly and effectively verbally and non-verbally with specialist or non-specialist individuals or audiences IV.1.4. Communicate clearly and effectively in writing with specialist or non-specialist individuals or audiences Iv.1.5. Use appropriate terminology according to the audience (specialist or non-specialists) Iv.1.6. Talk in public/ in front of a group IV.1.7. Listen attentively and synthesise accurately relevant information IV.1.8. Show empathic response where appropriate
IV. 2.Team work
IV.2.1. Demonstrate ability to work with other pharmacy students to achieve a common goal IV.2.2. Recognise the roles/contribution of different members of staff and other HCPs IV.2.3. Demonstrate cooperation within multidisciplinary teams IV.2.4. Solve conflicts between peers

IV.2.5. Acknowledge ideas/opinions of others
IV.3. Respectful
IV.3.1. Be fair and tactful in all dealings with staff, pharmacy students, patients and healthcare professionals IV.3.2. Demonstrate regard for staff, pharmacy students, patients and healthcare professionals Iv.3.3. Act in a way that shows I am a professional student Iv.3.4. Adhere to dress code (written and unwritten) at University and when going on placements
IV. 4. Ethical behaviour
IV.4.1. Act in patients' best interest IV.4.2. Conform with the seven principles of the Code of Ethics IV.4.3. Conform with the need for confidentiality within the University and practice settings IV.4.4. Do not show prejudice IV.4.5. Demonstrate appreciation and consideration towards others IV.4.6. Put patients' needs above my own IV.4.7. Take responsibility for my own decisions and actions IV.4.8. Behave in a manner which instils confidence

Appendix 20:

Topic guide for the focus group with academics at University B

Introduction
Hello, thank you everyone for coming. As it is described in the information sheet, the aim of my project is to identify the competencies of pharmacy undergraduate students and to develop a competency framework. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. If you didn't have the time to sign the consent form, and agree to participate in this panel, I'll give you a minute now to do so.

At the beginning of the list of competencies, I have put the explanations for competency, competence, performance and clusters so that you can understand better these words. You could also see at the very beginning of the document a summary of the competency framework.

Instructions
Did you all have the time to have a look at the draft of the competency framework that I emailed? If YES, go on. If NO, give them 2 minutes to go through the competency framework and concentrate on the "pharmacy abilities" cluster. In case you haven't brought it, here is the draft of the competency framework that I emailed you.

As an overview of the panel I'll tell you briefly what we will be doing. I would like to go through the whole competency framework. There are four clusters. I would like to concentrate on the "pharmacy abilities" cluster and I reserved more time for it. There is less time allocated for the other clusters

I would like you to consider if any of the behavioural indicators need to be refined or made clearer? Which are the changes that you suggest? In the discussion I would like the group to get consensus/ agree on the behavioural indicators.

I would like to start with the cluster entitled pharmacy abilities. Ok, thank you very much for this. I would like now to move on to the next cluster, which is "study abilities". You have 15 minutes to discuss the BIs in this cluster.

OK. Shall we move on to the 3rd cluster, entitled "personal management" please? You have 10 minutes to discuss the Bis in this cluster.

Thank you very much. Time is running so I think we should move on the discussion to our next and final cluster called "interpersonal". You have 10 minutes to discuss the behavioural indicators in this cluster.

Thank you very much for your input. Thank you very much to all for attending.

Appendix 21:

Topic guide for the focus group with experts in education

Hello, thank you everyone for coming. As it is described in the information sheet, the aim of my project is to identify the competencies of pharmacy undergraduate students and to develop a competency framework. These competencies and the use of a competency framework could prove valuable to prepare students for professional practice. At the beginning of the list of competencies, I have put the explanations for competency, competence, performance and clusters so that you can understand better these words. You could also see at the very beginning of the document a summary of the competency framework.

Did you all have the time to have a look at the draft of the competency framework that I emailed? If YES, go on. If NO, give them 2 minutes to go through the draft of the competency framework individually. In case you haven't brought it, here is the draft of the competency framework that I emailed you.

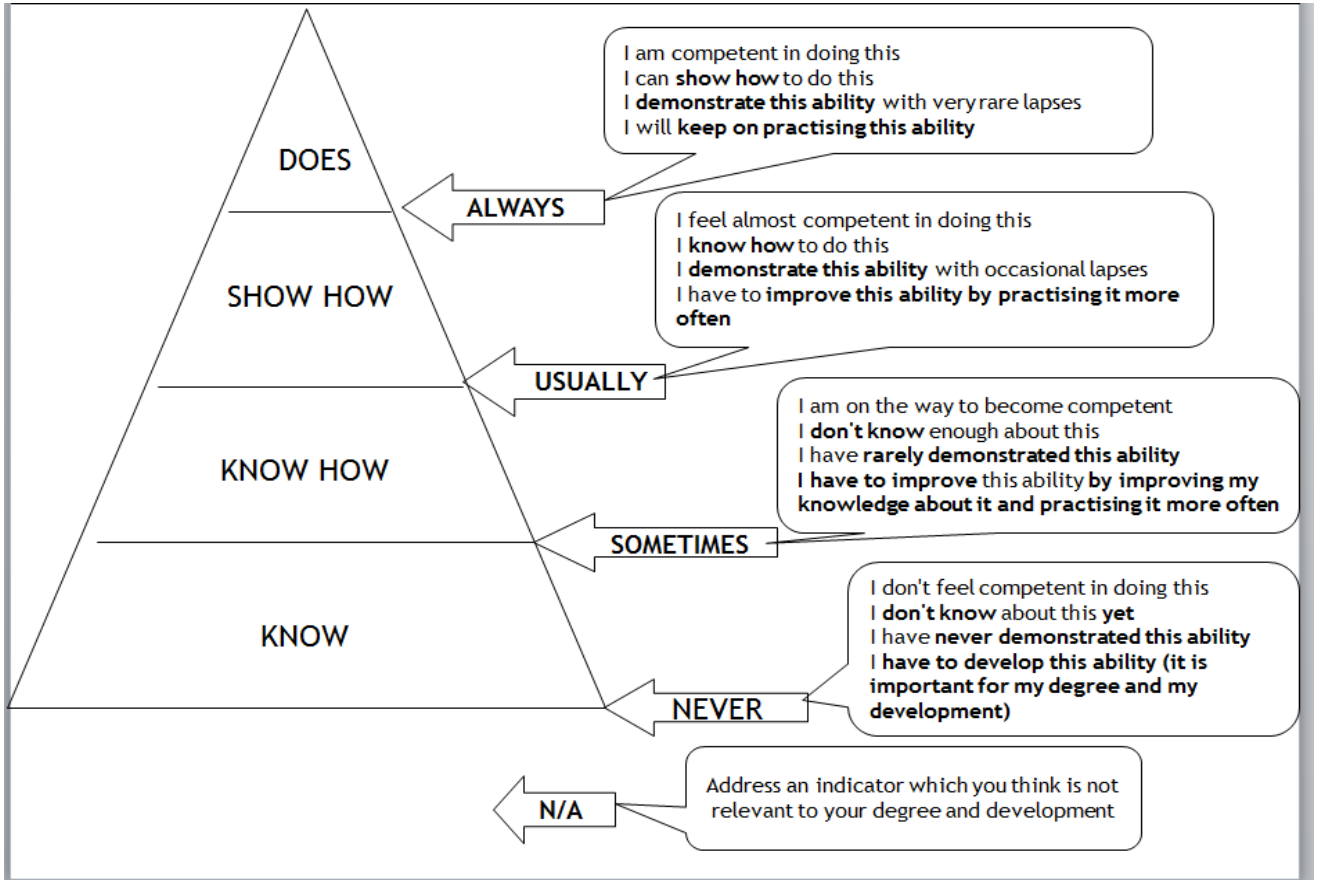
As an overview of the panel I'll tell you briefly what we will be doing. I would like you to give your opinions about the questions that I am going to ask.

1. How appealing to students do you think this is?
2. How would you suggest to make it more student friendly?
3. How would you convince students to engage with it?
4. What types of scales do you think would be most appropriate for this framework?

I would like to start by asking you how appealing to students do you think this is? Ok, thank you very much for this. I would like now to move on the next question. How would you suggest to make it more student friendly? That's great, thank you. Shall we move on now? How would you convince students to engage with it? Ok. Thank you very much for this, I would like to move on to the next topic, please. I came across different rating scales. Provide participants with a few examples.

Thank you very much for your input. Thank you very much to all for attending.

Appendix 22: Explanation of the rating scale mapped onto Miller's pyramid (Miller, 1990)



Appendix 23: PDF questionnaire used in the evaluation

MyCompetencies Checker

Student number _____
This is a confidential questionnaire, but your student number is required to link this questionnaire to any further ones.

Instructions:
Please answer honestly.
Please provide your answers by ticking the appropriate options, follow other directions and answer all questions.

Thank you for your time!

1. Are you ☐ Female ☐ Male?

2. What is your country of birth? _____

3. How old are you? [years]

4. Do you hold a previous degree? ☐ Yes ☐ No

If yes, please specify_____

5. Do you have a part-time job during **term time**? ☐ Yes ☐ No (If NO, please go to question 6)

5a. If **yes**, is your job healthcare-related? ☐ Yes ☐ No (If NO, please go to question 6)

5b. If **yes**, please specify_____

6. Do you have a part-time job during **summer**? ☐ Yes ☐ No (If NO, please go to question 7)

6a. If **yes**, is your job healthcare-related? ☐ Yes ☐ No (If NO, please go to question 7)

6b. If **yes**, please specify_____

7. How long ago did you decide to study pharmacy?
_____years

8. Was pharmacy your first choice of university course? ☐Yes ☐No ☐ Unsure

9. Were you encouraged by your family or friends to study pharmacy?

☐Yes ☐No ☐ Unsure

10. List your top 3 motivations for wanting to be a pharmacist

1. _____
2. _____
3. _____

11. Do you want to do post-graduate study? ☐Yes ☐No ☐ Unsure

12. At the moment, which branch of the profession would you most like to work in?
(choose ONE option only)

☐ Community pharmacy ☐ Teaching and research

☐ Hospital pharmacy ☐ Industry / wholesale / marketing

☐ Outside the profession (not pharmacy related)
Please specify_____

☐ Other (pharmacy related)
Please specify _____

MyCompetencies Checker

Rating your existing level of ability in competencies

Use the following questions to assess your current level of ability in each of the 2 competency clusters: Professional and Delivery of Patient Care competencies. Each competency cluster is divided into a range of discrete competencies.

Use the questions, in each specific competency box as a way to reflect on your current level of ability for that competency. Put a circle around the descriptor which best describes your **CURRENT** level of ability in this competency – either: you use (and can do) that competency: always or usually or sometimes or never.

You are asked to rate your own performance against each skill using a four-point scale, with the following definitions:

<table>
<tr><td>ALWAYS</td><td>I am competent in doing this
I can show how to do this
I demonstrate this ability with very rare lapses
I will keep on practising this ability</td><td></td></tr>
<tr><td>USUALLY</td><td>I feel almost competent in doing this
I know how to do this
I demonstrate this ability with occasional lapses
I have to improve this ability by practising it more often</td><td rowspan="2">Abilities where you score ‘sometimes’ or ‘never’ are clearly areas you should be developing early on in your study and you may need to put in more time and effort to develop them. The abilities where you score ‘usually’ may not need urgent attention, or you may need less work to get to a point where you can demonstrate you can do them really well. If you score ‘always’ in an ability, this means that you think you demonstrate this ability well and need to keep on practising it to maintain this level. In this case you should try and find an example which demonstrates how well you do it.</td></tr>
<tr><td>SOMETIMES</td><td>I am on the way to become competent
I don't know enough about this
I have rarely demonstrated this ability</td></tr>
</table>

	I have to improve this ability by improving my knowledge about it and practising it more often	
NEVER	I don't feel competent in doing this I don't know about this yet I have never demonstrated this ability I have to develop this ability	There is a fifth category, N/A (not applicable), which you can use when addressing an indicator which is not relevant to your study or development.

PROFESSIONAL COMPETENCIES

Competencies ***Rating***

Time management

Are you able to…	…plan your own study time?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…set, work towards and meet deadlines, using an appropriate amount of time?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise (make practical use of) others' time wisely in meetings and group work?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…arrive on time for any appointments or commitments (lectures / workshops/ placements/ meetings with tutors)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Prioritisation

Are you able to…	…prioritise tasks effectively?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Initiative

Are you able to…	…initiate activities to complete the tasks/assignments after initial instruction?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Task completion

Are you able to…	…complete tasks and assignments accurately and make sure they meet their respective objectives?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Accountability

Can you…	…be counted on to fulfil the responsibilities you have taken or have been given to you, and meet the expectations?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Information technology

Are you able to…	….use word processing, spreadsheets and presentation software?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	….use specific software required for workshops and practical classes?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Team work

Are you able to…	…demonstrate your ability to work with others to achieve a common goal?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…be fair and tactful in all dealings with staff, peers, patients and other healthcare professionals?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…resolve conflicts between peers?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

PROFESSIONAL COMPETENCIES

Competencies ***Rating***

Problem solving

Are you able to…	…identify the problem(s) that require(s) solving, for example, in patient care?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…gather information about the problem(s)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…evaluate information that has been gathered?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…recognise your own limitations and seek appropriate assistance?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…suggest and if appropriate, implement solutions to problems?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…identify where a compromise in solving the problem(s) is/are necessary?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Critical appraisal relevant to patient care

Are you able to…	…use appropriate resources (library catalogue, databases, internet, journals, text books, other people) to gather information related to a task (patient disease state, essay, dissertation, project report)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…employ effective and efficient literature search strategies using appropriate keywords?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…evaluate the relevance and trustworthiness of the information found in relation to healthcare?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…critically appraise the information found in relation to healthcare?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…interpret statistical and epidemiological data in research reports relevant to patient care/healthcare?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…conform with referencing requirements and avoid plagiarism in essays, dissertations and project reports?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

PROFESSIONAL COMPETENCIES

Competencies ***Rating***

Ethics and professionalism

Are you able to…	…promote the good of every patient in a caring, compassionate, and confidential manner?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…respect the autonomy and dignity of each patient?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…act with honesty and integrity in all professional matters?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…respect the values and abilities of others	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…take responsibility for your own decisions and actions in academic and patient care environments?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…adhere to written and unwritten dress codes at the University and when going on placements?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Reflective practice and Continuing professional development

Are you able to…	….reflect on performance and feedback throughout the learning experience (coursework, practicals, workshops)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…respond openly and positively to feedback from peers, tutors and assessments?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…identify your learning needs to improve performance?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…identify self-directed learning opportunities?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…keep a record of your own development processes and learning experiences?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…engage in developing your professional competence?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

DELIVERY OF PATIENT CARE COMPETENCIES

Competencies ***Rating***

Health, illness and patient

Are you able to…	…gather accurate and comprehensive patient information and drug-related data, using relevant sources (patients, healthcare professionals, medical notes, reference books)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of physiology, pathophysiology and anatomy in order to formulate a therapeutic care plan?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of metabolic pathways for carbohydrates, amino acids and lipids to inform your decisions about formulating a therapeutic care plan?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of metabolism of lipoproteins and the medical problems associated with abnormal lipoprotein levels in order to formulate a therapeutic care plan and select appropriate drug(s) for the management of lipid disorders?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of the role of vitamins and minerals in metabolism and identify reactions utilised by these compounds in order to support your decisions in selecting the appropriate drug?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Drug specific issues

Are you able to…	…interpret patient and drug-related data needed to identify actual or potential drug therapy problems?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…address and prevent side-effects and toxicities from therapeutic agents by applying knowledge of mechanisms of toxicity?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…solve and prevent drug therapy problems related to dosage form, delivery system, and route of administration?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…interpret the importance of adverse drug reactions to patient care?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	… interpret the importance of drug interactions to patient care?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of the chemical stability of a drug under various conditions, and the recommendations of the manufacturers of medicinal products, in order to make recommendations to patients/carers/other healthcare professionals on the most appropriate manner in which to store medications?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

DELIVERY OF PATIENT CARE COMPETENCIES

Competencies ***Rating***

Patient adherence and concordance

Are you able to…	…assess patient adherence to previously prescribed medications?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…counsel patients and/or carers about drug therapy and proper use of medical devices according to their individual needs and in a timely manner?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…discuss how a patient's adherence to treatment can be improved for a better health outcome?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	...use knowledge of pharmacological properties of drugs, to increase adherence and improve therapeutic outcome?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…encourage patients to engage in decisions about their care?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	….use knowledge of pharmacological properties of drugs, to evaluate pharmacotherapeutic regimens?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…promote health improvement, wellness and disease prevention?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Selection of drug

Are you able to…	…apply principles of biochemistry to support your decision in selecting the appropriate drug(s)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…apply principles of medicinal chemistry to support your decision in selecting the appropriate drug(s)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…apply principles of pathophysiology to select the appropriate drug(s)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…recognise the pharmacological classification in which a therapeutic agent belongs?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…apply principles of pharmacology to select the appropriate drug(s)/ therapeutic agent(s)?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of how chemical structure of drugs influences absorption, distribution, metabolism and excretion in order to select the most appropriate drug(s)	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…utilise and integrate knowledge of the contribution of specific chemical features to drug stability and solubility in biological fluids and delivery vehicles, in order to determine the appropriate route(s) of drug administration	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…select and recommend the best dosage form for a patient?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

DELIVERY OF PATIENT CARE COMPETENCIES

Competencies ***Rating***

Selection of drug

Are you able to…	…apply pharmacokinetic and pharmacodynamic principles to select the appropriate dose and dosage schedule to provide the best therapeutic outcome?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…assess the impact of a health condition (age, pregnancy, renal or liver disease) on how drugs are metabolised to provide the best therapeutic outcome	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…select and use appropriate monitoring data to support decisions related to treatment?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Provision of drug product

Are you able to…	…evaluate if a patient's treatment is appropriate, safe and effective to ensure a good patient care outcome?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…ensure the clinical and legal validity of prescriptions?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…assure that there is no excessive medication use or unnecessary drug duplication in prescribing?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…identify signs or potential indicators of drug misuse or abuse?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…verify safety and accuracy utilising pharmaceutical calculations?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…accurately prepare and dispense medication(s) prescribed?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…correctly complete legally required records in the process of dispensing medicines?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

Communication with patients, carers and other healthcare professionals

Are you able to…	…use non-verbal communication with patients, carers and healthcare professionals?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…actively and empathetically listen to patients, carers and healthcare professionals and synthesise relevant information?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…verbally communicate a complex concept, idea, educational message or recommendation persuasively in appropriate terms, using correct English?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

DELIVERY OF PATIENT CARE COMPETENCIES

Competencies ***Rating***

Communication with patients, carers and other healthcare professionals

	…communicate a complex idea, educational message or recommendations persuasively in appropriate terms in writing, using correct English?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A
	…confirm patient/carer/ healthcare professional understanding of information communicated and clarify if needed?	ALWAYS	USUALLY	SOMETIMES	NEVER	N/A

For each of the following statements, please CIRCLE the response that most appropriately reflects your perception of yourself:

++ Strongly Agree	+ Agree	? Not sure	- Disagree	-- Strongly disagree

I consider myself as being an independent (autonomous) and self-directed learner	++	+	?	-	--
I am able to collaborate with my peers when undertaking learning activities	++	+	?	-	--
I am able to identify my own learning needs realistically	++	+	?	-	--
I am able to translate my learning needs into learning goals, plans and achievable outcomes	++	+	?	-	--
I am able to relate to tutors as facilitators and to take the initiative in making use of their expertise	++	+	?	-	--
I am able to identify resources appropriate to my different learning needs and goals	++	+	?	-	--
I am able to select and utilise effective strategies for making good use of learning resources	++	+	?	-	--
I am able to collect and validate evidence relating to my achievement of the various learning objectives	++	+	?	-	--
I want to learn new information	++	+	?	-	--
I enjoy learning new information	++	+	?	-	--
I have a need to learn	++	+	?	-	--
I enjoy a challenge	++	+	?	-	--
I enjoy studying	++	+	?	-	--

Appendix 24: Demographic section for third self-assessment of fourth year MPharm students

Student number _____

Instructions:

Please answer honestly.

Please provide your answers by ticking the appropriate options, follow other directions and answer all questions.

1. What was the title of your 4th year project?

_____

2. Have you secured a pre-registration place?

□ Yes □ No

If yes, which sector of pharmacy is it in, please specify _____

3. Was this your sector of choice?

□ Yes □ No

If not, what was you first choice sector, please specify_____

We would like to collect your exam results together with your MyCompetencies Checker to explore any associations between these. This is a confidential survey (your student number is required to link this survey to any previous ones and to your exam results, if access is given). If you DON'T WANT TO ALLOW the researcher to have access to your exam results, tick the box □

Appendix 25: Demographic section from the Course Experience Questionnaire

Instructions:
Please think about your course in general rather than identify individual subjects, incidents or lecturers when answering this questionnaire.
This is a confidential questionnaire, no one can identify you. Please answer honestly. Your responses are strictly confidential and will not be seen by teaching staff.
Follow the directions and answer <u>all</u> questions.

Please return the completed questionnaire at the reception, in the box provided, by X.
Thank you for your time!

1. Are you □ Female □ Male?

2. How old are you? | years |

3. Which year of Pharmacy study are you in?

□ 1st year □ 2nd year □ 3rd year
□ 4th year □ 5th year □ 6th year

4. Which year of University study are you in? _____year

5. Do you hold a previous degree? □ Yes □ No

6. Do you have a part-time job during term time? □ Yes □ No

6a. If yes, is your job healthcare-related? □ Yes □ No □ N/A

Note: N/A means not applicable

7. Do you want to do postgraduate study? □Yes □No □ Unsure

8. Have you always wanted to be a pharmacist? □Yes □No □ Unsure

8a. Was pharmacy your first choice of university course?
□Yes □No □ Unsure

9. Do you have a close family member who's a pharmacist?
□Yes □No □ Unsure

10. Do you have a family friend who's a pharmacist?
□Yes □No □ Unsure

11. Were you encouraged by your family to study pharmacy?
□Yes □No □ Unsure

12. Do you have any experience of chronic illness in your family or close social circle?
□Yes □No □ Unsure

13. How old were you approximately when you decided you want to study pharmacy?
_____years

14. At the moment, which branch of the profession would you most like to work in? (choose ONE option only)
□ Community pharmacy □ Academia + Research
□ Hospital pharmacy □ Industry / wholesale / marketing
□ Outside the profession (not pharmacy related)
Please specify_____
□ Other (pharmacy related)
Please specify _____

15. List your top 3 motivations for wanting to be a pharmacist

1_____
2_____
3_____

Appendix 26: Information sheet for pharmacy students participating in evaluation of the use of the PDF

A competency framework for pharmacy undergraduate students

We would like to invite you to participate in this research project exploring the competencies of pharmacy undergraduate students.

Aim of the study and possible benefits
The aim of the project is to, develop a competency framework for pharmacy undergraduate students to support your learning in professional practice. Your participation is essential to this research which will hopefully enhance students' ability to evaluate their competencies. As a student, through your contribution to the study, you may identify your learning needs, offering you the possibility to focus on improving your possible learning gaps in different areas related to your course.

You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is conducted and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

Participants
You have been approached as first/second/third/fourth year pharmacy undergraduate student studying at X.

Participation
Your participation is voluntary. Participation in the study involves completing a survey, which includes the developed competency framework, a characteristic form and a self-directed learning questionnaire. The competency framework is used to measure your perceived level of competence; the characteristic form to find out a little bit more about you and the self-directed learning questionnaire to measure your attitudes towards independent and self-directed learning. It should take no longer than 40 minutes to fill in the survey.

You have been provided this information sheet on the study so that you will have the opportunity to make an informed decision on whether to take part. A decision to withdraw at any time, or a decision not to take part, will not affect your performance assessment.

Ethical approval and confidentiality
The project is a collaboration between three universities and has been subject to an ethical review by the Ethics Officer at the Department of Pharmacy and Pharmacology at the University of Bath. To preserve your anonymity the research team will not have access to data linking your name to your student number, therefore, the collected data are anonymous. The members of teaching staff do not have access to the collected data. All collected data will be kept in locked filing

cabinets at the Department of Pharmacy, University X, for five years and then destroyed. If you wish, you may access the final report of the study.

What should I do if I want to participate in the study?
All you need to do is to fill in the survey.

What should I do if I don't want to participate?
If you don't want to take part in this research project all you have to do is not to fill in the survey.

Thank you for your time!
Your participation is important.

Appendix 27: Recruitment email for MPharm students at University B

Dear MPharm 3 students,

As you are aware, the OSCEs are scheduled to take place on the 2nd, 9th and 12th June. After the OSCE assessment X and Ioana Stupariu, from the University of Bath, would like to you to participate in her session where you can assess your level of competence. This information may help you during pre-reg interviews and also MPharm 4. These sessions, which will take approximately one hour, will take place at hourly intervals after your OSCE assessment. You can find more information about their research in the attached information sheet.

Appendix 28:

Topic guide for the focus group with pharmacy students at University B

Introduction
Thank you for coming to this focus group session. We expect this session to last about 45 minutes and we will try to be prompt.

We would like to make an audio recording of this discussion and to transcribe it to ensure that we do not misinterpret any ideas which are discussed by the group. We assure you that you and your views discussed here today will not be identifiable in any report we may write. Equally, we would like to ask you not to talk about any issues discussed here with anyone else than those present today unless otherwise agreed. If you consent for what I have just mentioned please this by signing this consent form.

As probably you know, a competency framework has been developed for pharmacy students to support your learning, known to you as MyCompetencies Checker. We're doing more work on this now by evaluating its use.

Topic for discussion
As discussed, this session will take approximately 45 minutes and we plan to discuss three topics relating to you perceptions of it. It would be great if everyone would participate! My name is X and I will be charring this focus group.

I would like to start with a warm up exercise; so in pairs please discuss what you understand by competency and then feedback to the rest of the group. Thank you for this, Now that we clarified what a competency is we could move on. During your fourth year you've completed this survey twice and will soon complete it for the third time. Here is a copy of the document, known to you as MyCompetencies Checker. What I would like you to do now is to critique this framework. I would like you to tell me which are the good and the bad things about it. Now, in pairs, please discuss your thoughts and then feed back to the group. Ok, let's start with the bad things: what could have been done better (about the format, descriptors, rating scale)? Let's now move on to the good things (about the format, descriptors, rating scale)?

Prompt questions:

- Was it an easy format for you to read? How would you suggest to make it more students friendly?
- What about the rating scale? Was it appropriate? Did you understand how to use it?
- Was there anything you found difficult? Why was that? How do you think this can be addressed?
- Were the descriptors clear/understandable? If not, what would you change about them? Which ones seem easier/more difficult to understand?

Before we finish the session, do you have any more comments?

Thank you!

Appendix 29: Tutors' guide for the first tutorial

Supporting students in
self-assessing their competence

Tutorial 1 – October 2009

At the very beginning please give to each student a work sheet. Copies of the work sheet (15) can be found towards the end of the guide book. In Appendix 4 you can find a copy of the information sheet that was given to students.

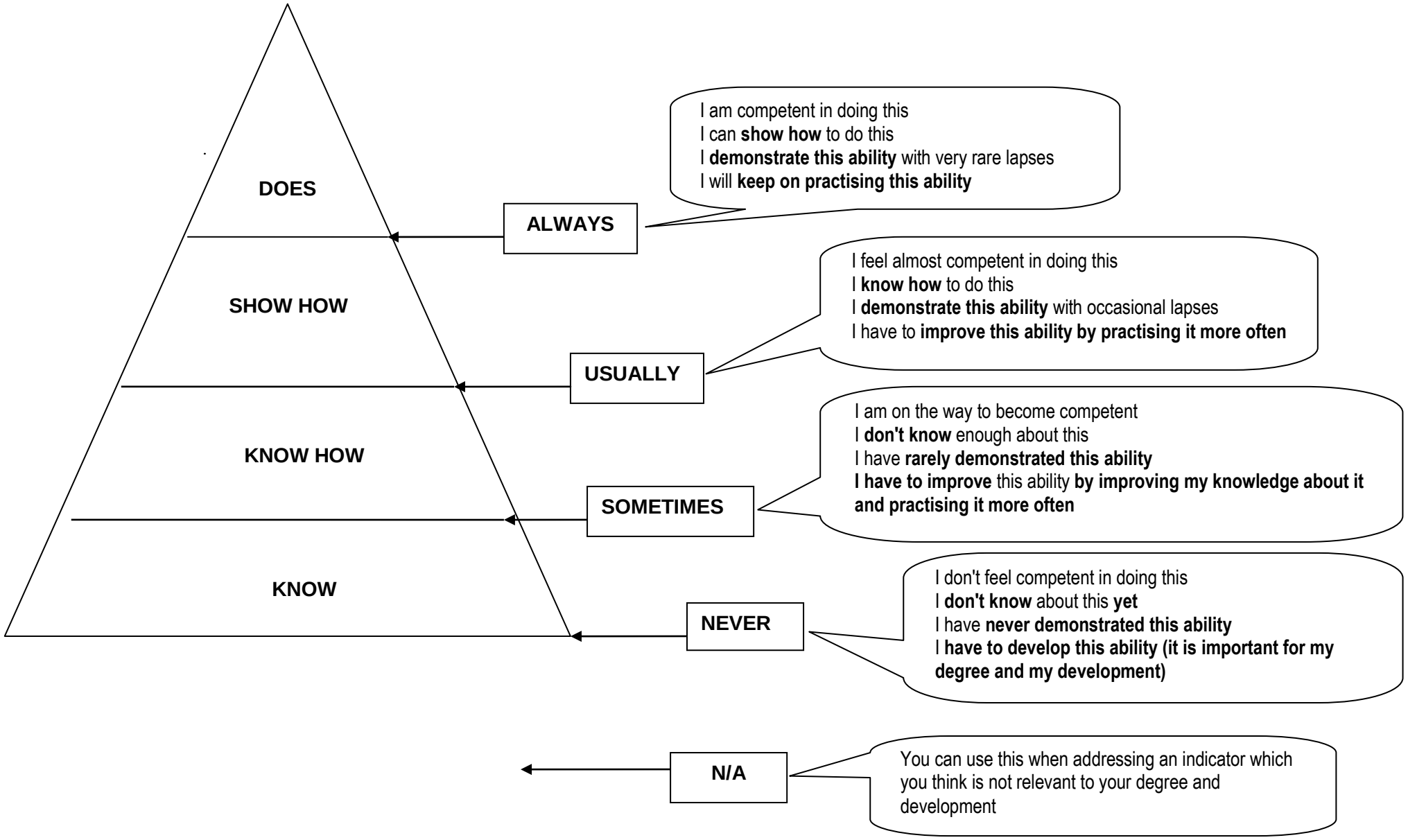
1. Students' learning style

Background: When students were introduced to the competency framework on Monday 12.9.2009, they were given a "mini learning style questionnaire", which supports them in identifying their learning style; students who know their preferred way of learning might become more efficient in their learning and development process.

- Students were asked to bring along for the tutorial the completed "mini learning style questionnaire"; at the end of the booklet you can find copies (15), in case they didn't bring them or forgot them;
- In case they didn't do this activity for the tutorial ask them to do it at the very beginning of the tutorial;
- You will use this questionnaire (the identified learning style) in Exercise 3

2. Going through one Competency from one of the Clusters

- To ensure students understand how to fill in the framework, go through one competency (Ethics and professionalism) within Professional Competencies Cluster for example, together with the students (see image below). We would like to ensure students understand the meaning of the rating scale and are able to use it. They should apply the same principle to all the descriptors within the framework.
- To help students understand better the rating scale I thought the association with Miller's pyramid might be helpful (the explanation of the rating scale does link with Miller's pyramid; see below):


DOES
SHOW HOW
KNOW HOW
KNOW
ALWAYS
I am competent in doing this
I can **show how** to do this
I **demonstrate this ability** with very rare lapses
I will **keep on practising this ability**
USUALLY
I feel almost competent in doing this
I **know how** to do this
I **demonstrate this ability** with occasional lapses
I have to **improve this ability by practising it more often**
SOMETIMES
I am on the way to become competent
I **don't know** enough about this
I have **rarely demonstrated this ability**
I have to improve this ability **by improving my knowledge about it and practising it more often**
NEVER
I don't feel competent in doing this
I **don't know** about this **yet**
I have **never demonstrated this ability**
I **have to develop this ability (it is important for my degree and my development)**
N/A
You can use this when addressing an indicator which you think is not relevant to your degree and development

- After you have explained to students the rating scale, ask them to rate themselves in the following competency:

10. PROFESSIONAL COMPETENCIES

ETHICS AND PROFESSIONALISM

Are you able to...

1. ...promote the good of every patient in a caring, compassionate and confidential manner

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

2. ...respect the autonomy and dignity of each patient?

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

3. ...act with honesty and integrity in all professional matters?

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

4. ...respect the values and abilities of others?

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

5. ...take responsibility for your own decisions and actions in academic and patient care environments?

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

6. ...adhere to written and unwritten dress codes at University and when going on placements?

○ ALWAYS ○ USUALLY ○ SOMETIMES ○ NEVER ○ N/A

- Address any question that students might have about the way to fill in the competency framework

3. Students' example of competencies they need to improve (10-15 mins)

- According to how students rated themselves in the Ethics and Professionalism competency , choose the behavioural indicators(descriptors of the competency) where they rated themselves the lowest (as a never or sometimes)

- Ask each of the students to write two of the ones they have chosen on the work sheet provided
- Ask students how they could use their identified learning style to help them to improve/develop these abilities; ask students to write in the work sheet two brief ideas on how it would help them (for example "to find better resources to improve them");
- Discuss with students how do they think to improve their performance in those two abilities; ask students to write two ideas of how to improve/develop each of the selected abilities in the work sheet; and feedback to the others their ideas. Note: if you're running out of time you can ask one student to talk about how he/she would improve the selected abilities and feedback to the others.

The only guidance you can give to students is to access the Bath University Student Support page at:
www.bath.ac.uk/students/support/ regarding the competencies within the Professional Cluster and their respective courses if they identify competencies they need to improve/develop in the Delivery of Patient Care Competencies.
N.B.: Please remember the tutorial are not in place to support students in how to improve their competencies but about how to use this tool which will help them to identify the competencies they need to improve/develop.

4. Emphasise the importance of project (few schools of pharmacy support their students in self-assessing their competence in preparation for practice)

- Emphasise BPSA student thoughts about the competency framework: use Appendix 3 in your folder;
- Discuss with students why self-assessment is important (see slide "attaining and maintaining competence" + it is something that you do life-long not only once you graduate)
- Pre-registration training interviewers said that if students will take this piece of evidence and collect also evidence of how they have improved/developed the identified learning needs that would be really valuable for employers/ pre-registration interviews.

5. Clarify the need for access to their student number and course work and exam results **(5mins)**

- For support use slide "overview of the pilot: phase 1"
- ***Student number*** is needed to be able to follow up the students' replies to the survey and, link these to their course work and exam results (if access is given). However students don't have to write their student number, this is why we have to underline the importance of completing it. Students have to be assured that the researcher will not be able to link their student number to their names – this will be done by administrators.
- ***Access to exam results:*** students' approval is needed in order to have access to their exam results. Please explain to the students why this is needed; for support see slide "overview of the pilot: phase 2". Please assure students that the researcher will not be able to link the exam results to their names and that all data will be coded prior to analysis – it will be confidential and anonymous.

6. Signpost students to:

- Deadline for uploading the 1st completed survey on Moodle (the exact date will be communicated to you prior to the tutorial)
- 2nd tutorial: which will take place at the beginning of the 2nd semester (they will be emailed the exact date closer to the date)

Any other questions

Appendix 1: Student thoughts about the importance of engaging with the competency framework

-
- "Help with CPD and continuous development assessment "
- "Keep an update profile of my competencies"
- "Identify areas I need to improve on"
- "Learn more beyond the study lecture"
- "Would prepare me to pre-registration training plus job"
- "I can clearly see the goal"
- "See it is a vital tool for learning"
- "Important to relate what we learn in the course to the career"
- "Focuses you in on key areas of learning "
- "It would be attractive to employers "

Appendix 2: Work sheet for students (tutorial 1)

1) Please write the 2 abilities you think you have to improve/ develop from the ones in the Professional Competencies Cluster:

_____

2) How do you think you could use your learning style to help you to improve the above mentioned abilities? Please provide 2 brief ideas (for example "to find better resources to improve the identified abilities)

_____

3) How do you think you will improve/ develop the abilities identified at question 1? Please provide 2 ideas for each

Ability A_____

Ability B _____

Appendix 30: Tutors' guide for the second tutorial

Supporting students in
self-assessing their competence
Tutorial 2, February 2010

Tutorial 2 – October 2009

Overview of the 1st tutorial

As a quick reminder, in the 1st tutorial the following topics were covered: students' learning style, a discussion going through one competency (ethics and professionalism) from one of the clusters (professional competencies); asking students' examples of the competencies they need to improve (chosen from the example given); and an emphasis on the importance of the project and the need for access to their student number and exam results.

For the 1st tutorial you were provided with: the presentation that was given to you in the tutor training session; the "MyCompetencies Checker", a copy of the online tool and examples of students' thoughts about the importance of engaging with the competency framework (from BPSA conference). If needed, you can use these in the 2nd tutorial.

Overview of the 2nd tutorial

This time the "MyCompetencies Checker" will have two parts instead of three. Part one "your background" has been removed at this stage of the assessment.

During the tutorial there are 5 topics to be discussed. Indications for timekeeping have been given for each topic, you may notice that some discussions move on more quickly. Please take notes of the discussions in the "tutor notes" given below or ask the students to write down their answers in student worksheets as indicated below.

At the very beginning please give to each student a worksheet. Fifteen copies of the worksheet have been provided. Attached to the worksheet there is a summary of the competency framework, to remind students which competencies were encompassed in the two clusters (this will be needed in Ex.4 in students' work sheet).

N.B.: Please ensure that all the students attending the tutorial fill in their student number at the top of the worksheet and that you collect ALL the worksheets at the end of the tutorial, thank you!

In this **2nd tutorial** please discuss the following topics with the students:

1. Reminder: topics discussed in the 1st tutorial

- Ask if the students want to be reminded about the topics discussed in the 1st tutorial. If yes, please do so (see above "overview of the 1st tutorial").If not, go to the next topic.

2. Usefulness of the competency framework

2a. Ask the students how could the competency framework support them in their learning. Please take notes of students' thoughts in the tutor notes.

2b. On a scale from 1 to 4 ask students to tell you how useful did they think the competency framework has been in supporting their learning and to circle their answers (this is Ex.1 in students' worksheet):

1 – not at all useful

2 – partly useful

3 – useful

4 – very useful

2c. Ask the students to answer the following two questions. The 1st question is for the students who circled options 3 or 4 in the above exercise and the 2nd is for the students who circled options 1 or 2.

- Question 1: ask the students to write down in their worksheet *how did the competency framework support them in their learning* (3 thoughts each; this is Ex.2 in students' worksheet)?
- Question 2: ask the students to write down in their worksheet 3 thoughts about *why do they find the competency framework useful (those who circled 2) OR not useful (those who circled 1)?* (3 thoughts each this is Ex.3 in students' work sheet)

2d.*GENERAL DISCUSSION :* Ask the students to give their top reason of the 3 for how the competency framework supported them, why they found the

competency framework useful OR not useful and discuss implications of these on using the competency framework**. Please take notes of the general discussion in the tutor sheet, thank you.**

3. Students' level of confidence

3a. Ask the students to indicate in their worksheet (Ex. 4) how confident they feel in the 2 competency areas.

Professional competencies

☐	☐	☐	☐
Not confident	Satisfactory but not confident	Confident in some cases but would like more experience	Fully confident in most cases

Delivery of Patient Care Competencies

☐	☐	☐	☐
Not confident	Satisfactory but not confident	Confident in some cases but would like more experience	Fully confident in most cases

3b. Ask the students write 3 reasons for each of the 2 areas (6 reasons in total) why they feel they are at the indicated level of confidence in these competencies, in their worksheet (this is Ex.5 in students' worksheet).

3c. *GENERAL DISCUSSION:* Ask the students to give their top reason of the 3 for why do they feel they are at the indicated level in each of the 2 competencies and discuss the implications of these in using the competency framework. **Please take notes of the discussion in the tutor sheet**.

4. To help students in their 2nd self-assessment, give the mean of each competency area from the 1st self-assessment to the students to reflect on before the 2nd self-assessment (provided in Appendix 1). The self-assessment scale has been converted into numbers for calculating the means (always=4, usually=3, sometimes=2 and

never 1). The nearer the students' means are to 4, the more competent they self-assessed themselves. The means are provided to you separately with student numbers; you can circulate the list and ask the students to take note of their two means. Due to participant confidentiality student names cannot be linked to the means.

4a. Ask the students if the mean was something they expected. **Please take notes in the tutor sheet** of how many expected and how many didn't expect the given mean result.

5. Reminders for students – all this information was also given in 1st tutorial

5a. Student number

Ask students if they filled in the competency framework in October. If they did, they need a reminder and if they did not, they need to learn: it is important for students to understand that the ***student number*** is needed for us to be able to:

- follow up the students' responses to the survey; and
- link these responses to their exam results (if access is given).

However students don't have to write their student number in the online survey, this is why we have to underline the importance of completing it. Students have to be assured that neither the researcher nor the tutors will be able to link their student number to their names – this is done by administrators.

5b. ***Access to exam results:*** students' approval is needed in order to have access to their exam results.

- Please explain to the students why this is needed; for support see slide "overview of the pilot: phase 2" from the tutor training session, which is in the appendices of the 1st tutorial.
- Please assure students that the researcher will not be able to link the exam results to their names and that all data will be coded prior to the analysis – the data are confidential and anonymous.
- Students will be asked in the online survey if they would like to give the researcher access to their exam results. Only those who are filling in the competency framework for the first time need to answer this question in the online survey.

5c. Why should they fill in all the 3 assessments?

- It is important to be able to follow up the students during the whole year in order to evaluate the use of the competency framework in the MPharm course.
- At the end of the 3 assessments, the researcher will provide to those students who will request a copy of the results of their 3 assessments using the competency framework, which will show the development of their competencies in the 3rd year. They could use this for their pre-registration interview.
- After their 3rd self assessment of their competencies using the MyCompetencies Checker there will be a prize draw for those students who completed all the 3 assessments. Five of these students will receive a £20 book/ cinema voucher

6. Signpost:

- Deadline for uploading the 2nd completed survey: **MONDAY 1st of MARCH 2010,** the link will be posted on Moodle

N.B.: Please remember that the tutorial is not in place to support students in how to improve their competencies but about how to use this tool which will help them to identify the competencies they need to improve/develop.

The only guidance you can give to students is to access the Bath University Student Support page at:
www.bath.ac.uk/students/support/ regarding the competencies within the Professional Cluster and their respective courses if they identify competencies they need to improve/develop in the Delivery of Patient Care Competencies.

Appendix 1: **Mean of the 2 competency areas from the MyCompetencies Checker** (not provided due to ethical reasons)

Appendix 2: **Tutor notes sheet**

1. Attendance _____ students out of _____.

2a. How could the competency framework support them in their learning?

2d. General discussion:

Top reasons of:

2d.1. how the competency framework supported them (if the case)

2d.2. why the competency framework was useful (if the case)

2d.3. Why the competency framework was NOT useful (if the case)

and their implications to the competency framework .

3c. General discussion:

Top reasons of why do they feel they are at the indicated level in each of the 2 competency areas and discuss the implications of these in using the competency framework

5a. Was the mean in the two competency areas in their first assessment something that they expected?

_____students expected that result

_____students didn't expect the result

Appendix 3:**Work sheet for students (tutorial 2)**

STUDENT NUMBER_____

1. On a scale from 1 to 4 how useful do you think the competency framework has been in supporting your learning? Please circle the appropriate answer:

1	2	3	4
Not at all useful	Partly useful	Useful	Very useful

2. How did the competency framework support you in your learning? Please only answer if you circled **options 3** or **4** at the above exercise. Please write three of your thoughts briefly.

_____

3. Why do you find the competency framework useful (please only answer if you circled **option 2** at Ex.1) or

Why do you find the competency framework not useful (please only answer if you circled **option 1** at Ex.1)

Please write three of your thoughts briefly.

_____

b. Please indicate overall, how confident you feel in the following areas by selecting the appropriate answer:

Professional competencies

☐	☐	☐	☐
Not confident	Satisfactory but not confident	Confident in some cases but would like more experience	Fully confident in most cases

Delivery of Patient Care Competencies

☐	☐	☐	☐
Not confident	Satisfactory but not confident	Confident in some cases but would like more experience	Fully confident in most cases

2. Please give **three reasons** why you feel you are at the above selected levels of confidence in those competencies?

Professional Competencies

_____

Delivery of Patient Care Competencies

_____